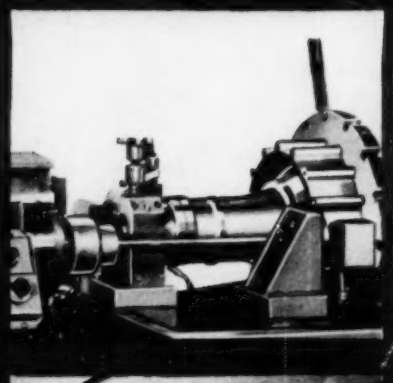
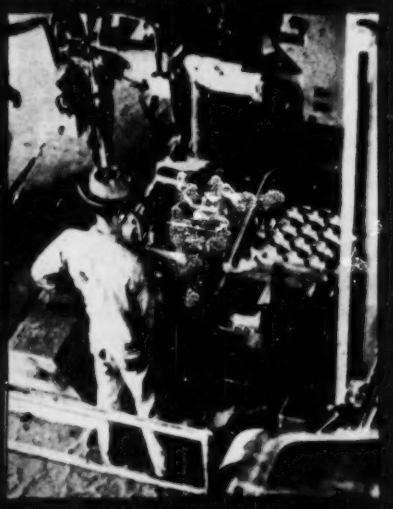
OVERSEAS EDITION
DECEMBER 1954

DIGEST

INTERNATIONAL BUSINESS AND INDUSTRY





MACHINE-TOOL TRENDS point toward highly specialized machines, planned replacement programs. Ultimate goal: automatic machines . . . . . p 13

QUALITY CONTROL cuts costs, rejects, waste, and customer complaints. Six-step program gets the credit . . . . p 16

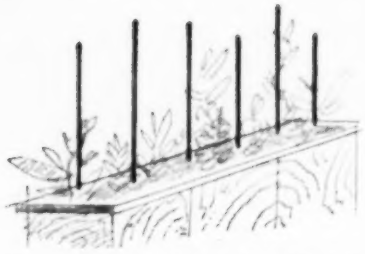
TWO POWER PLANTS, revolutionary in concept, will operate at pressures up to 5,000 lb. per sq. in. . . . . p 21

VERMICULITE, a versatile material, finds new uses in construction to save weight and fireproof buildings . . . . . p 24

PUSHBUTTON FOUNDRY is another forward step in automation. An automatic molding machine makes a 2½-lb. casting every second . . . . . p 31

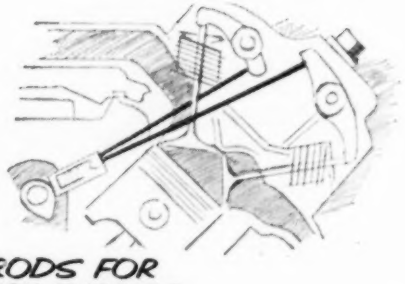
ANNUAL INDEX for the Digest will enable you to refer quickly to material published this year to get information you may need . . . . . p 53

FROM *the Bundy Sketchbook*
TO *jog a designer's imagination*



MODERN ROOM DIVIDERS

PARTS FOR CHILD'S STROLLER

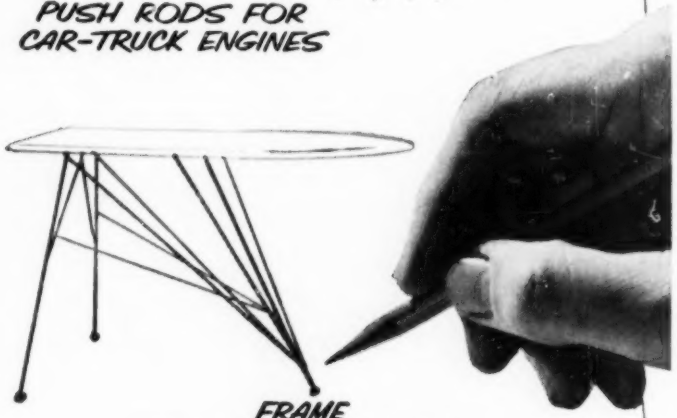


PUSH RODS FOR CAR-TRUCK ENGINES

REMARKS The success (or failure) of that new tubing application hinges largely on the tubing you specify. Why not tip the scales in your favor by using strong, lightweight Bundyweld, the only tubing double-walled from a single metal strip. Added bonuses: Bundy's expert engineering assistance, unexcelled fabrication facilities.

WRITE today for catalog or for help in developing your tubing idea.

BUNDY TUBING COMPANY
DETROIT 14, MICHIGAN



FRAME FOR IRONING BOARD

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness,

and passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

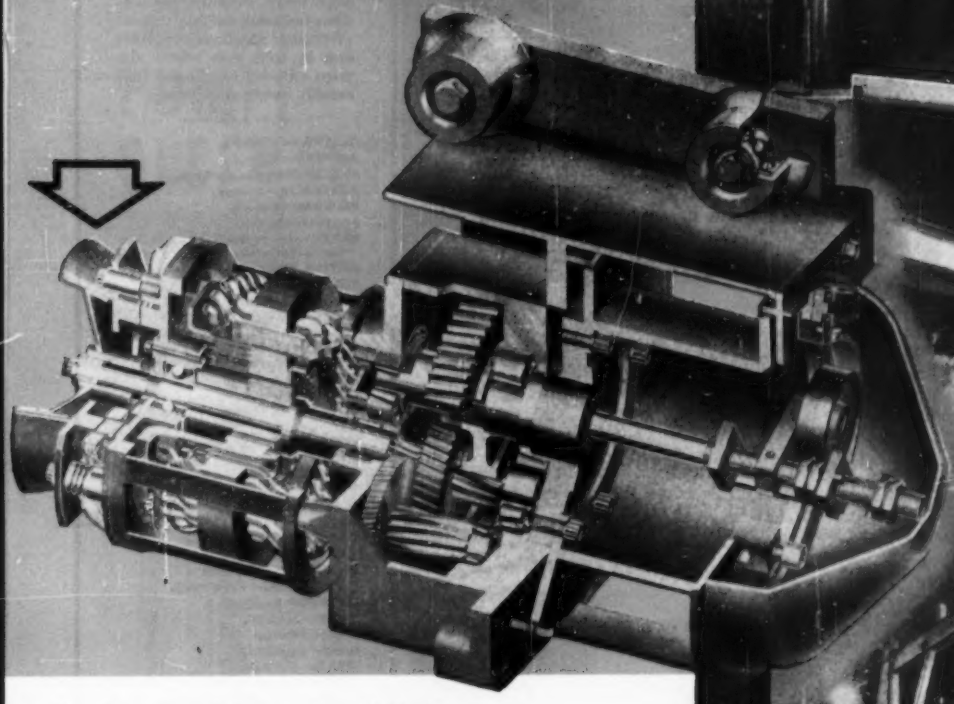
BUNDYWELD TUBING®

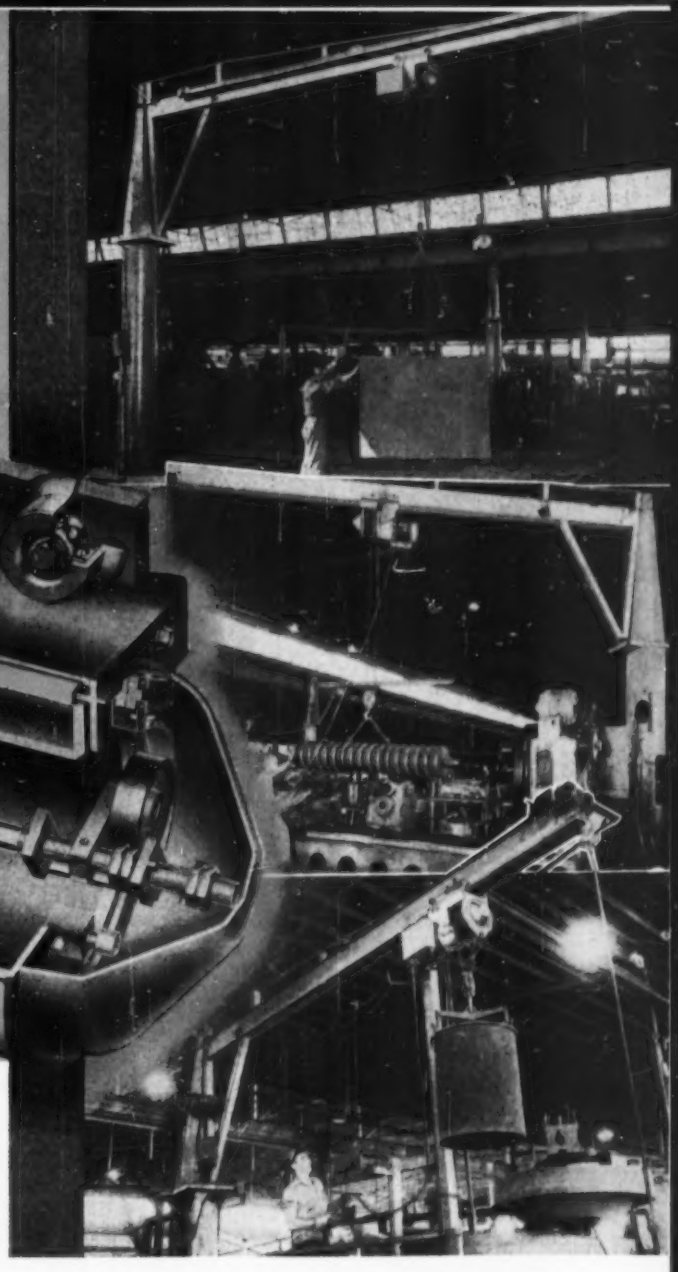
DOUBLE-WALLED FROM A SINGLE STRIP

Leakproof
High thermal conductivity
High bursting point
High endurance limit
Extra-strong
Shock-resistant
Ductile

Lightweight
Machines easily
Takes plastic coating
Takes plating
Bright and clean
No inside bead
Uniform I.D., O.D.

BIG LIFTS
Demand the
BIG BRAKES
of LeTourneau Hoists





Combination Motor-Load Brake Gives Positive "Inching" Control

The first lift tells you — here's a hoist that delivers when you signal. Pick up your load. The ready-to-go LeTourneau Motor lifts the load *instantly* — delivering maximum torque to lift your load during even the briefest period of electrical contact between switch and motor. Then, no matter how short the lift, when the load is where you want it, release the control button: The load *stops instantly*, without slip — whether going up or coming down. The reason for this positive control is the LeTourneau *combination motor-load brake*. It's synchronized with the motor to let you "inch" any load of 4 to 15 tons to the exact level you want it. The high braking capacity friction surfaces engage automatically when power is cut off in the motor circuit — and release just as quickly when motor is started. As a result, you can now get the absolute load control you've always needed.

This control is possible because of "matched" design and construction, for LeTourneau manufactures *all* the hoist components: the variable-speed A. C. motor, the integral automatic brake system, and the simple gear reduction and all-steel housing.

A new bulletin has been prepared to give you the full story on these hoists and how they will make your *big* lifts easier. Write for a copy today.

LeTOURNEAU LET EQUIPMENT

it CAN be done... with

LETOURNEAU

R. G. LeTourneau, Inc., Longview, Texas, U.S.A.

LeTourneau Hoists Handling BIG Lifts: Top illustration: maneuvering a heavy crate on a loading dock. Center illustration: positioning a steel mill roller in a machining lathe. Bottom illustration: transferring materials during heat treating.

Write for full information on LeTourneau Hoists and Jib Cranes. Distributor inquiries invited.

R. G. LeTourneau, Inc. Cable Address
24111 South MacArthur BOBLETORNO
Longview, Texas, U.S.A.

Please send me complete information on:

- ☐ LeTourneau Hoists.
- ☐ LeTourneau Jib Cranes.
- ☐ Distributorship for the following territory:

Name_____

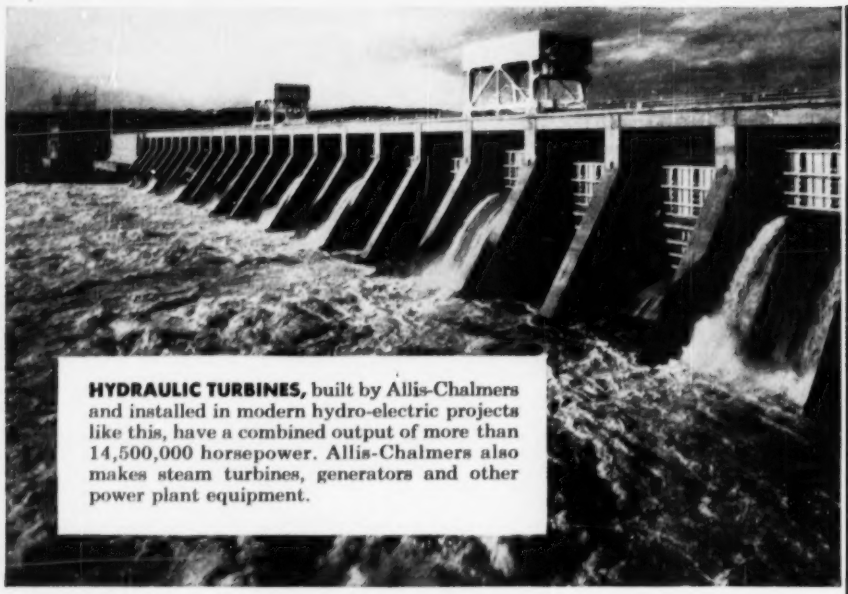
Title_____

Company_____

Address_____

City and State_____

XF 102

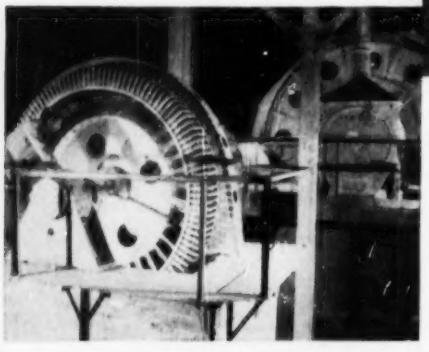


HYDRAULIC TURBINES, built by Allis-Chalmers and installed in modern hydro-electric projects like this, have a combined output of more than 14,500,000 horsepower. Allis-Chalmers also makes steam turbines, generators and other power plant equipment.

Keeping pace with growing power needs

When London got its first underground railway in 1897, Allis-Chalmers built the power generation equipment. Today, Allis-Chalmers is still a leader in power generation, distribution and utilization equipment—is one of the world's great suppliers of the equipment shown here.

UNIT SUBSTATIONS are used in many industries as a safe, practical way to bring high voltage close to the load center, to reduce voltage drop and improve efficiency. Unit Substations are only one of the many types of power-distribution apparatus built by Allis-Chalmers.



ELECTRIC MOTORS are the prime movers of modern industry. As a major motor manufacturer for over 50 years, Allis-Chalmers has produced units ranging in size from ½ to 35,000 horsepower. Here you see a 600-horsepower Allis-Chalmers synchronous motor being used to drive a grinding mill.

ALLIS-CHALMERS

BASIC MACHINERY FOR THE WORLD'S MAJOR INDUSTRIES

ALLIS-CHALMERS DISTRIBUTORS ARE LOCATED THROUGHOUT THE WORLD

The Allis-Chalmers distributor in your country is ready to give you as much help as you *want or need*. He is backed by complete Allis-Chalmers engineering, research and testing facilities. These services are readily available to you, your staff and your consulting engineers to determine the most profitable means of operation and to help you select the most efficient equipment that exactly meets your needs.

ALASKA—Fairbanks.
ALGERIA—Alger.
ARGENTINA—Buenos Aires.
AUSTRALIA—Sydney.
BELGIUM—Brussels.
BOLIVIA—La Paz.
BRAZIL—Rio de Janeiro, São Paulo, Recife (Pernambuco), Porto Alegre.
BRITISH BORNEO—Sandakan.
BURMA—Rangoon.
CANADA—Montreal.
CHILE—Santiago.
COLOMBIA—Barranquilla, Bogota, Medellin, Cali.
COSTA RICA—San José.
CUBA—Havana.
DENMARK—Copenhagen.
DOMINICAN REPUBLIC—Ciudad Trujillo.
EL SALVADOR—San Salvador.
ENGLAND—London.
FINLAND—Helsinki.
FRANCE—Paris.
FRENCH MOROCCO—Casablanca.
GREECE—Athens.
GUATEMALA—Guatemala.
HAITI—Port-au-Prince.
HAWAII—Honolulu, Hilo.
HONG KONG—Hong Kong.
ICELAND—Reykjavik.
INDIA—Bombay.
IRAN—Teheran.
IRAQ—Baghdad.
ISRAEL—Tel-Aviv.
ITALY—Milan.
KENYA—Nairobi.
MALAYA—Kuala Lumpur, Ipoh, Kota Bharu, Penang.
MEXICO—Guadalajara, Mexico City, Monterrey, Tijuana.
NETHERLANDS—Amsterdam, The Hague.
NEW ZEALAND—Wellington.
NICARAGUA—Managua.
NORWAY—Oslo.
PAKISTAN—Karachi.
PANAMA—Panama.
PERU—Lima.
PORTUGAL—Lisbon.
PUERTO RICO—Ponce, San Juan.
REPUBLIC OF INDONESIA—Djakarta, Surabaja.
REPUBLIC OF THE PHILIPPINES—Bacolod City, Cebú, Manila.
SARAWAK—Kuching.
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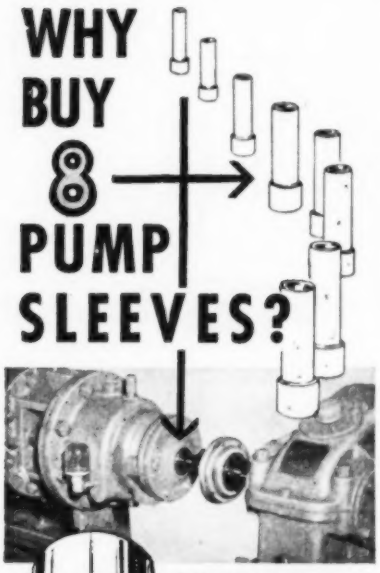
DELORO STELLITE
ends needless overhauls

WHY BUY 8 PUMP SLEEVES?



YOU JUST NEED 1

Tearing down equipment to replace parts costs you plenty. DELORO STELLITE sleeves keep pumps running many times longer in conditions of abrasion or corrosion. Eight times longer is not unusual when both are working against your vital pump parts.

So why buy eight sleeves; why tear down pumps eight times? Specify DELORO STELLITE sleeves on all new pumps. Our FREE booklet "Hardfacing with DELORO STELLITE" shows you how to rebuild worn steel sleeves for much longer life than when new.

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DIGEST

. . . the best from 44 business magazines—see p60

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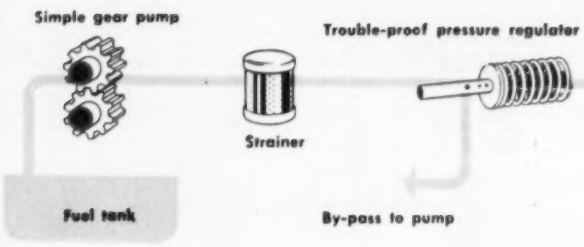
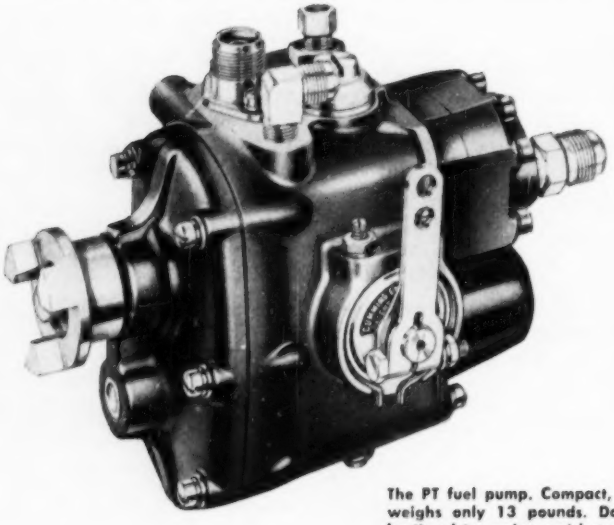
Here's the simplest diesel fuel system ever developed!

Simplest pump and fuel control arrangement



Cummins new PT *fuel system...*



The PT fuel pump. Compact, easy to handle, weighs only 13 pounds. Does not have to be timed to engine, quick and easy to install.

The PT injector utilizes the exclusive Cummins principle of fuel injection which has set the highest standards of performance and economy for more than 20 years.

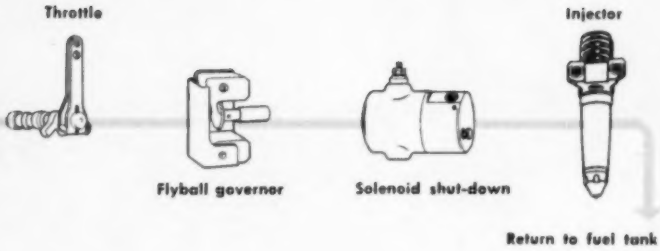
THE revolutionary new PT fuel system, now standard on all Cummins Diesels, has fewer and far simpler parts than carburetor and ignition systems or ordinary diesel fuel systems. It is easy to understand, simple to work with, can be serviced by any mechanic. No longer any need for fuel system specialists! The PT fuel system has undergone two years of field testing and millions of operating miles under every conceivable condition. Its dependability record is phenomenal. Operators report even less fuel consumption than with earlier Cummins fuel systems and far less cost of maintenance. The PT fuel system can be installed on any Cummins Diesel built since 1932.

CUMMINS DIESEL EXPORT CORPORATION

Columbus, Indiana, U.S.A.

New York City Office, 1459 Chrysler Building, East, New York 17, N.Y.

3-23-54



PT advantages over gasoline systems:

No contact points to adjust	No vapor-lock problems
No condenser to replace	No flooding
No spark coil to short	No choking or priming
No wiring harness to short	No needle valves to clog
No spark plugs	No butterfly valve
	No float level to maintain
	No float valve to stick

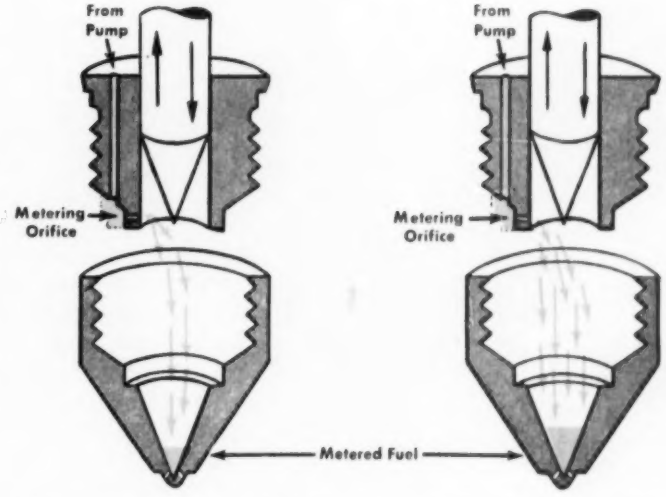
PT advantages over ordinary diesel systems:

No fuel rack adjustments	No distributor discs
No check valves	No metering pumps
No needle valves	No high-pressure fuel lines
No helixes	No fuel pump timing

... ..simpler to work with than gasoline carburetion and ignition

Simplest Fuel Metering Device

The principle is simply that the amount of fuel flowing through a fixed orifice varies according to the amount of pressure on the fuel. Pressure is controlled by the throttle on the PT pump. Fuel flow through orifice is cut off as injector plunger, actuated by engine camshaft, moves down to inject fuel.



When engine is under partial load, fuel pressure is low, and only a small amount of fuel passes through orifice into injector cup.

When engine is under full load, fuel pressure is increased, and greater amount of fuel passes through orifice into injector cup.

Mail this today, and get more PT facts!

CUMMINS DIESEL EXPORT CORP., Dept. MH-12, Columbus, Indiana, U.S.A.

Please send me free illustrated folder, "Cummins PT Fuel System."

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Company _____

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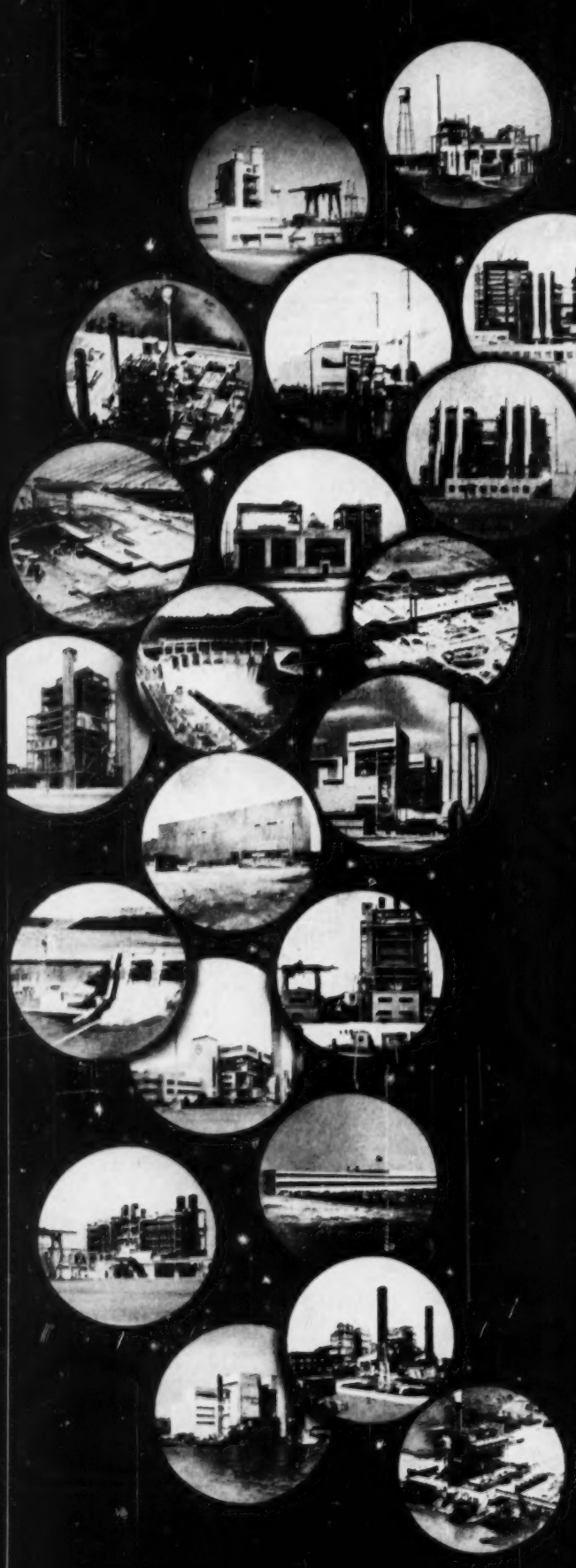
leader in lightweight highspeed diesel power 60–600 h.p.



More than Two Billion Dollars of Plant Construction

In its half-century of service to business and industry, Ebasco has been responsible for the engineering and construction of more than two billion dollars of new plants.

These plants have been built for many industries, in many countries. Each has been an individual project—individually handled, individually engineered—from site selection, initial planning, engineering, through finished construction. And each has been the product of Ebasco teamwork . . . teamwork that calls into action the services of Ebasco's highly-experienced specialists.

Your new plant will benefit from the application of this specialized experience. The caliber of the engineers and constructors behind your plant may well determine the extent of its future success.

Our booklet—"The Inside Story of Outside Help"—tells the story of Ebasco and its services. For a copy, without obligation, write Ebasco Services Incorporated, Two Rector Street, New York 6, N. Y.

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BUSINESS TRENDS

BUYING AMERICAN GOODS will be easier for foreign businessmen under a new Export-Import Bank credit plan now being developed. Plan is U. S. answer to foreign export insurance—now supplied by some 20 European and other governments—that has enabled foreign exporters to sell on far easier terms than American exporters.

Here's how the plan will work. The Ex-Im Bank will grant automatic or semiautomatic credits to U. S. exporters, depending on their own and customers' credit standing, then will guarantee loans by commercial banks against these credits. In turn, exporters will use the loans (running from 3 to 5 years at a minimum 5% interest) to extend credit to foreign buyers.

To qualify for credit under the plan, the importer will pay at least 20% down; the exporter will share another 20% of the risk, the Ex-Im Bank guaranteeing the remainder. Speedy handling of transactions is a key aim.

Various built-in safeguards will prevent the plan from contributing to an international credit war —as feared by some economists (Mc-G Digest, Nov, p9). Among them: (1) Ex-Im Bank credits will be based on an exporter's past volume; (2) all transactions will be screened for dollar availability of the importing country.

FOREIGN MANUFACTURERS of electrical equipment should look toward the U. S. for more business in the next 15 years. A 1954-1970 forecast by *Electrical World* points to an enormous expansion.

The forecast is keyed to two main factors: (1) estimated gross national product in 1970 of $562-billion, up 58%; (2) a far bigger gain in the nation's "electrical life," perhaps 200%, because of ever-rising living standards, industrial mechanization, and atomic-energy demands.

The industry's 1970 summits are probably:
Output capability: 304-million kw., up 199%.
Sales: 1,213-billion kw. hr., up 200%.
Industrial sales: 496-billion kw. hr., up 155%.
Residential sales: 439-billion kw. hr., up 307%.

CLOSED-CIRCUIT TELEVISION is fast becoming a major U. S. business and should find use in Europe too. Today 52 cities from coast to coast, with 88 TV-equipped theaters, can be linked together simultaneously for color shows—many more for black-and-white events.

Chief use is for country-wide sales-promotion seminars for major companies' wholesalers and retailers (sports promoters also use the system to theater-televise fights.) Some examples:

- The Ford Motor Co. this year reached 35,000 dealers simultaneously in 39 cities.
- Chrysler Division of Chrysler Motors Corp. spoke to 3,200 dealers in 28 cities.
- General Motors Corp. planned a program this fall, linking dealers in 63 cities.
- The American College of Physicians held a TV seminar for 10,000 doctors. The bill was paid by a drug firm.

Cost of big closed-circuit hookups depends on length and type of show, but in any case is high—anywhere from $1,200 to $2,700 per city. Thus an elaborate multi-city production can easily cost $100,000. But the new medium is worth-while despite high costs, many businessmen think. TV dramatizes a show, gets it over with maximum impact, and brings dealers close to a firm's top management.

STEEL, lodestone of U. S. industry, is signalling the year-end trend of business. Key pointers:

- The industry's operating rate, which slipped to 62% in midsummer, rebounded to above 72% of capacity, with further gains indicated.
- Steel scrap, frequent industry bellwether, jumped to $32 a ton, up nearly $9 since spring and at its best price since December, 1953.

Behind the steel recovery lie these key factors:

- Cuts in manufacturers' inventories. As a result, they must now reorder to fill new needs. Also, automobile manufacturers have resumed buying after plant shutdowns for new model retooling.
- Buoyancy of construction (highways, bridges, etc.), mainstay of steel this year.
- A pickup in demand from appliance, farm implement, pipe and warehouse consumers.
- German rearmament, which is expected to produce new orders for the U. S. industry.

Actually, the apparently low level of steel-industry operating rates is misleading because of recent immense expansion (present annual capacity: 124-million tons, up nearly 30% since 1949). For example, prospects are that 1954 output, although sharply under 1953's all-time 112-million-ton record, will still be better than 1949's. Thus 1954 will rank as one of the ten best production years in the industry's history.

INTERNATIONAL TRENDS

WASHINGTON—U. S. officials are trying to shape a new Asiatic economic development program to check communist expansion in the Far East. Vehicle for the program, if it materializes, would be the Colombo Plan—the British Commonwealth technical assistance pool that now includes all the major free Asiatic nations. Fuel for the program would be sharply increased U. S. economic aid.

Tentative U. S. plans call for turning the loose Colombo machinery into something like the Organization for European Economic Cooperation. It would funnel U. S. aid into the area, integrate national development programs, and attack regional trade barriers.

U. S. aid funds that have already been approved for use in Asia total roughly $1-billion. U. S. agricultural surplusses also could be tied into the program. Washington hopes the Asiatic countries will take the lead in working out the new program. U. S. ideas are highly tentative, subject to change at Asiatic suggestion. Harold Stassen, chief of the Foreign Operations Administration, is slated to tour the Far East soon to sound out Asiatic leaders on the possibilities.

JOHANNESBURG—Two gigantic and complementary projects, one British and the other American, may help transform southern Africa into an advanced industrial continent.

1. British railway: A British business syndicate is weighing plans for a $50-million, 1,000-mile railway to link the Rhodesias in the east with the coast of South West Africa. Crossing the continent via north Bechuanaland, it would open up rich mineralized and ranching areas; permit export of coal from the big fields at Wankie, Southern Rhodesia; and facilitate use of Okavanggo River water for irrigation.

2. American ore field: After a 2-year survey, the Bethlehem Steel Corp. has plans for an $85-million harbor, railway and iron-ore mining project in north South West Africa. It has located two large ore fields in the Kaoko Veld with an estimated 75-year life at 3-million tons yearly.

The two projects have tremendous potential significance because: (1) The British line could carry Wankie coal to Bethlehem's project, permitting South West African ore to be smelted locally instead of in the U. S.; (2) South West African port facilities would be strategically important to the West, especially as an outlet for Rhodesian chromium.

LONDON—Expectations, tinged with apprehension, that the all-out competitive fight between Ford and General Motors in the U. S. (McG-H Digest, July, p7) may spill over into the British market has the automobile industry agog.

The alarm was sounded in the fall when GM's President Harlow Curtice, on a visit here, announced a $100-million expansion to double output of GM's Vauxhall subsidiary. Earlier, Ford's President Henry Ford visited England but announced no spectacular expansion plans. But British observers ask: If GM is going to spend $100-million, isn't Ford likely to follow suit?

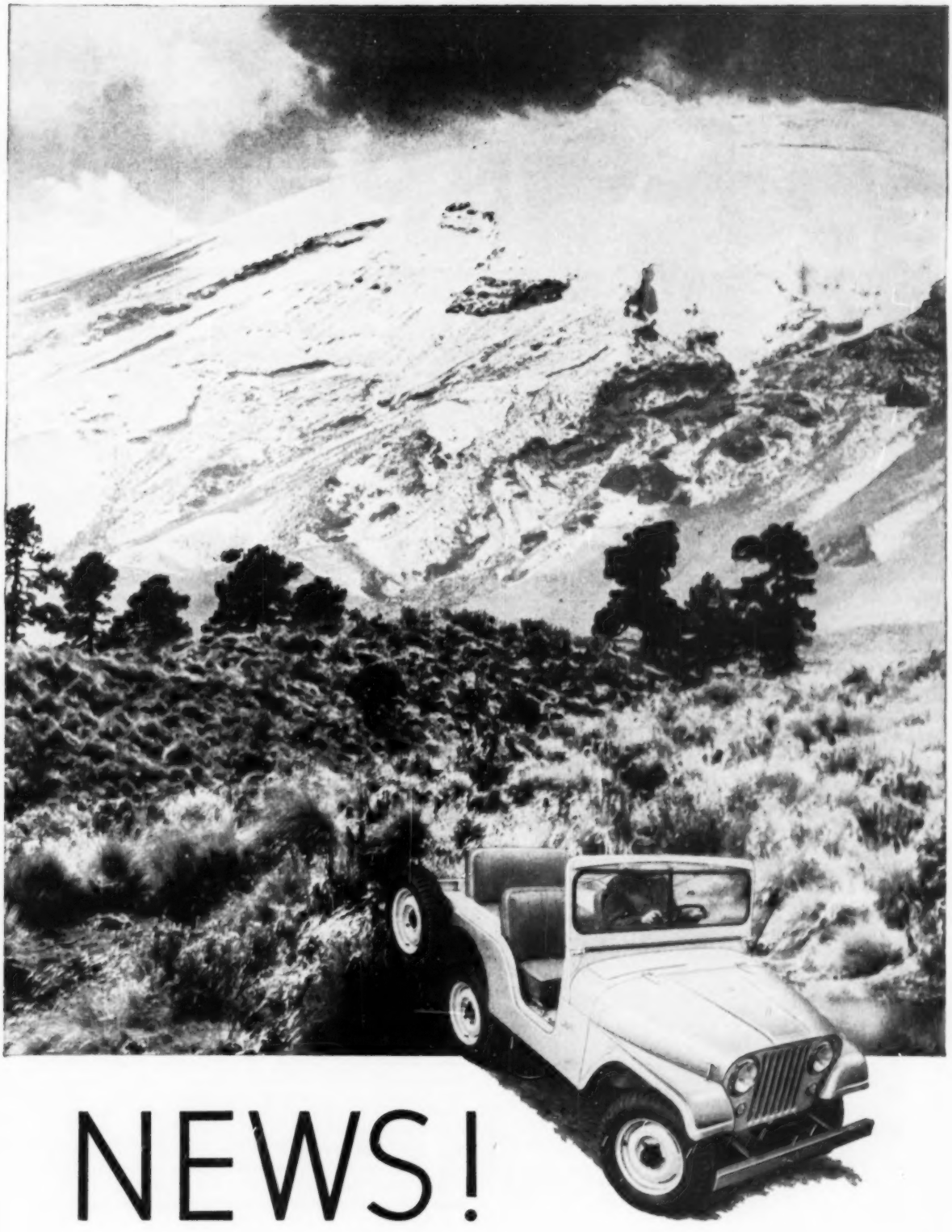
British reaction has already found expression in the statement by Sir Leonard Lord, chief of the British Motor Corp. (Austin, Morris), that he would "not bandy millions with the Americans." But, significantly, he said that BM would boost its expansion beyond the $25-million budgeted.

What worries the British is not only that GM and Ford may carry their rivalry into Britain but that this may lead to revolutionary industry changes. Well-informed sources hint the U. S. will build new assembly lines equipped with the latest in push-button automation. If so, British firms will be forced into immense competitive capital outlays for similar equipment.

The same could happen on the Continent. GM's Opel already plans a $71-million expansion. Another result will be more business for English and German machine-tool builders. Much of the transfer-machine business will go to German builders as British companies so far have been reluctant to tackle these special machines.

GENEVA—Talk and actions of U. S. representatives to the ninth annual meeting of the General Agreement on Tariffs and Trade (GATT) can be interpreted better if you realize that they are trying to strengthen the program. They believe that failure to do so will halt progress toward free trade and payments and destroy the whole structure of trade agreements negotiated within GATT since the war.

The U. S. is seeking five major changes in GATT: (1) creation of a permanent organization with some executive powers, (2) permitting underdeveloped countries more leeway to protect infant industries, (3) tightening the rules against import restrictions for balance-of-payments reasons, (4) permitting quotas on agricultural imports only when they protect price support programs, (5) making tariff concessions under GATT permanent.



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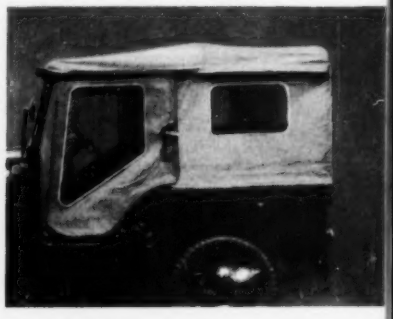
FULL VERSATILITY of the 'Jeep' has been retained . . . yes, even increased in this new model. With its 4-wheel-drive and *Hurricane* Engine, there is packed into the new 'Jeep' the most widely-useful power of any vehicle—of any size.

NEW, WIDER FENDERS protect the 'Jeep's' occupants from splashed mud and water. The new, sturdy design of body and fenders not only creates a pleasing appearance, but also offers tremendous resistance to damage.



THE NEW 'JEEP' TOP has side walls that fit flush with the 'Jeep' body to keep out weather. Walls can be rolled up and secured; doors can be removed and stored above the driver's seat.

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. . . plus NEW Features Throughout!

New, Sinewy Strength For the 'Jeep' Frame: A new, fully-boxed, front cross-member adds to the carrying strength, rigidity and rugged endurance of the new 'Jeep's' frame.

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New, Larger Windshield: Has 72 square inches of additional glass area and folds on stronger hinges. New streamlined hood offers increased visibility.

New, Easier Riding Springs: Front and rear—4 inches longer—provide excellent stability and long life.

New, Softer Front Seating: Form fitting, bucket design with coil springing gives an unbelievably comfortable ride. Driver's seat is adjustable to 3 positions fore and aft. Double and single seating for driver and 2 passengers, available at extra cost.

New Type Rear Seating: Provides options for carrying up to 4 passengers with wheelhouse pads or center seat. Total seating capacity, front and rear, is 7 passengers.

New Instrument Panel: With new back-lighted instrument cluster.

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YOU CAN SEE THE EXTRA STAMINA reflected in every detail of this newest automotive masterpiece—the ALL-NEW 4-Wheel-Drive Universal 'Jeep'.

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Throughout the far-flung battlefronts of World War II, a phenomenal automotive achievement helped make history. It was called "the mighty Jeep".

In 1945 Willys introduced this amazing war-proved and improved vehicle to the civilian market as the Universal 'Jeep'. Over the years, Willys engineers and technicians have added improvements . . . features such as the sensational *Hurricane* Engine with its greater performance and economy.

And now . . . Willys brings you the NEW . . . the *completely* NEW Universal 'Jeep'—the climax of all 'Jeeps' that Willys has ever built! Although it seemed impossible to build a more rugged 'Jeep' . . . Willys has done it . . . and the new 'Jeep' proves it with increased stamina reflected in every detail.

It's a wider and longer 'Jeep' with more space inside. You ride easier on longer springs and softer seats. These and scores of other advanced features, tested and found worthy in exacting military and civilian use, are now yours in the truly new . . . and truly magnificent Universal 'Jeep'.

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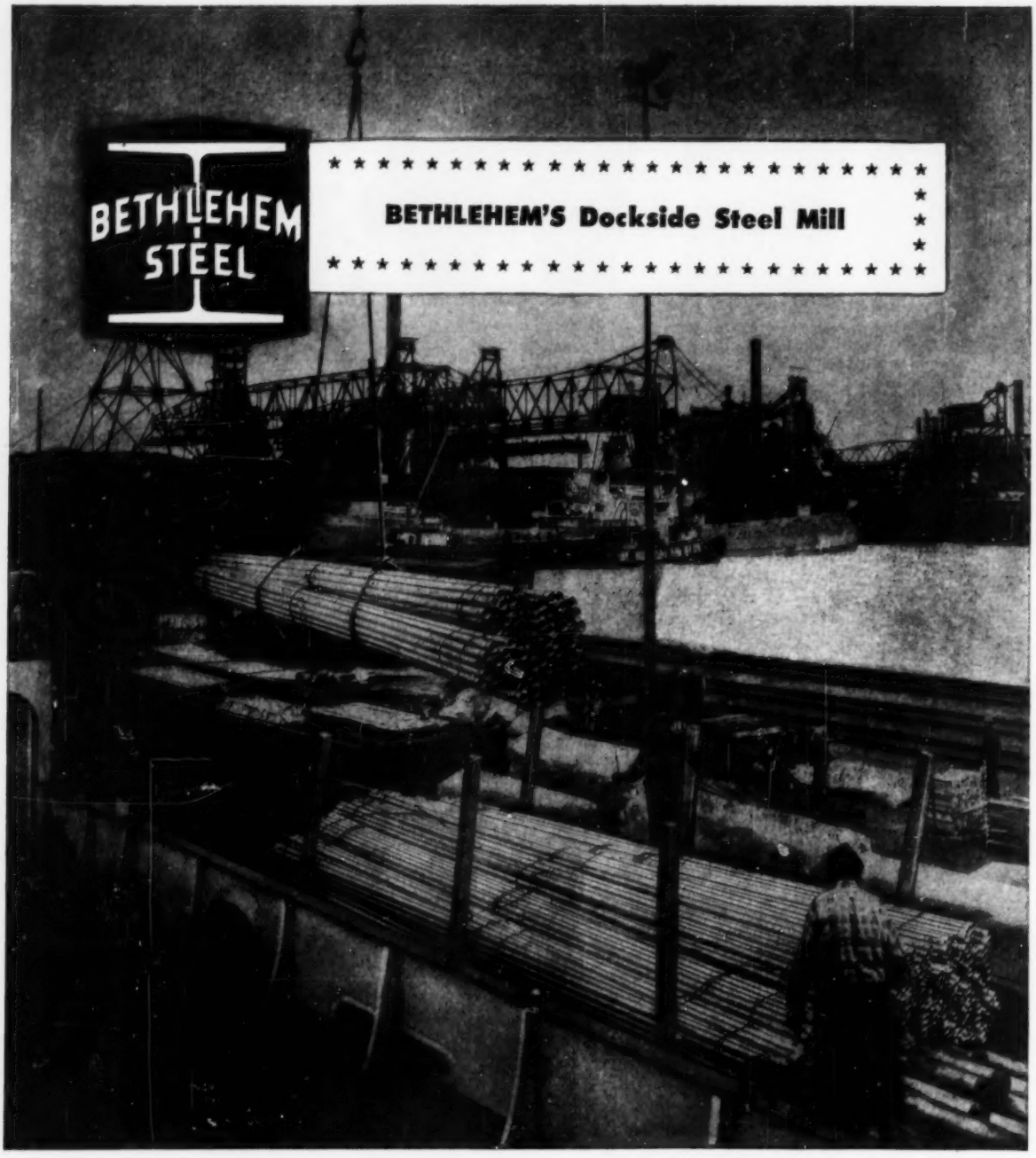

The world's largest steel mill located on tidewater is Bethlehem's great Sparrows Point plant in the Port of Baltimore, U.S.A. Loading products for export at this plant has two advantages to the purchaser.

First, it eliminates the delays caused by long overland freight hauls.

Second, it minimizes the possibility of damage by greatly reducing the handling required.

Our Sparrows Point plant has served the export market for years. With its tidewater location, it can quickly put your order on the way – thereby saving days or even weeks. Moreover, we have three plants on the Pacific Coast of the U.S.A. to help serve Far Eastern markets. Bethlehem Steel Export Corporation, 25 Broadway, New York 4, U.S.A. Cables: "BETHLEHEM, NEWYORK."

Bethlehem supplies steel to world markets in all forms, including

BARS ★ ALLOY STEELS ★ TOOL STEELS ★ PLATES ★ STRUCTURAL SHAPES ★ SHEETS ★ STRIP ★ TIN PLATE ★ PIPE ★ WIRE PRODUCTS ★ RODS ★ RAILS

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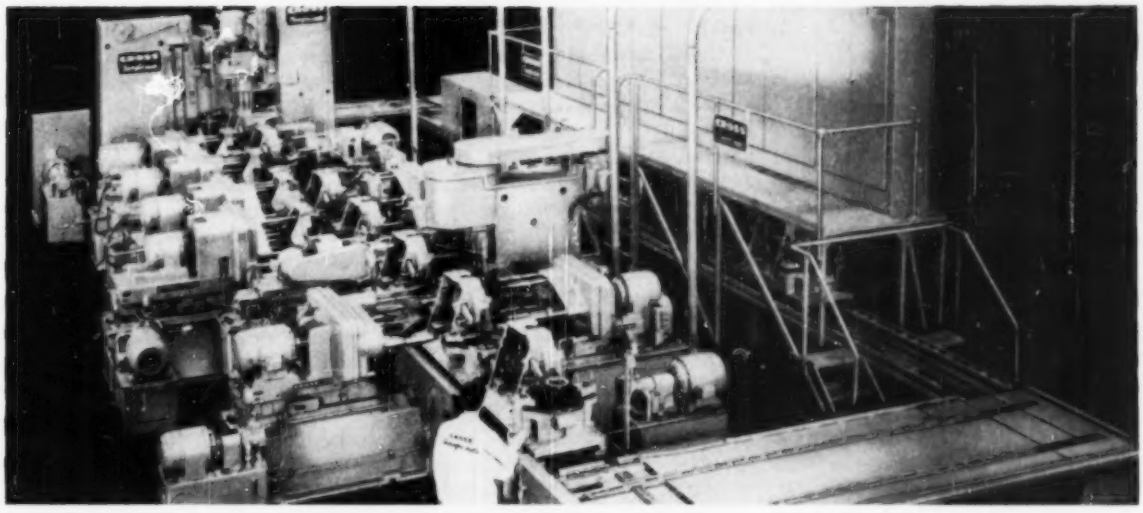
McGRAW-HILL
DIGEST



Transfer machine (Cross), which performs 97 operations on axle-gear carriers, indicates direction of . . .

Modern Machine-Tool Trends

WHEN ONE of our early ancestors discovered that he could form softer materials by striking and working them with a sharp, hard stone, he invented the first edge cutting tool. In the centuries since then, the edge cutting tool has been regarded by many as the most useful device ever developed by man.

Centuries later, as more power was needed to drive the cutting tools, the machine tool came into being. Most of us are prone to think of machine tools being invented long ago and in use for hundreds of years. But it was the 50 years from 1800 to 1850 that saw the development of the standard machine tools—in England and in New England. Twenty five years before, Wilkinson invented the boring machine. Then came Stowel's screw cutting machine in 1809, Eli Whitney's milling machine and Blanchard's profile lathe in 1818, Fitch's turret lathe in 1845.

In this last hundred years, with machine tools available, the most rapid progress in history has been made in the industrialization of our economies. And throughout this century, the development of machine tools continued, leading to the many highly specialized machines at work in our factories and now to what we call automation.

The latest spurt in machine-tool development has made many a factory superintendent take a close, critical look at his equipment and at his production costs. As a result, more of them are examining the benefits of planned machine replacement programs.

The *Machinist* magazine (London) reports, for example, that one metalworking firm, after 7 years' experience with its program, saves £40,000 a year. Furthermore, these savings are multiplying as the average age of the equipment grows younger. Other gains: improved product quality and precision, shortened manufacturing cycle.

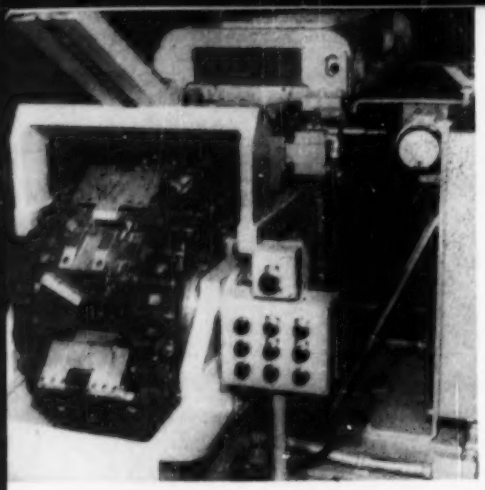
Even though U. S. management in general recognizes the value of planned replacement and the practical advantages of modern machine tools, the machine-tool industry in the U. S. is, at present, in a period of declining business. New orders have slid sharply for 2 years.

For this year, shipments should amount to between $900-million and $1-billion—somewhat lower than last year's $1.2-billion. Much of this business is due to a large backlog at the beginning of the year. The backlog is now down to a few months, except for builders of highly specialized machines for mass-production industries. Most machines are quickly available to buyers, both domestic and in export.

An important factor affecting both short-term and long-term conditions in the industry is the export situation. A combination of circumstances—rising European production, sheltered markets because of exchange controls, export restrictions because of the Korean war, remarkably liberal credit terms and lower prices on foreign machine tools—has cut U. S. exports to about 8%. This is far below the more than 20% that the industry once relied on to cushion its lean years in domestic sales.

A survey of machine-tool manufacturers by the DIGEST shows that 65% expect next year's exports to equal this year's figure, 10% look for lower exports, 25% (admittedly optimistic) look for higher.

One thing is certain—American



CONTINUOUS broaching machine (Lapointe) can be equipped with hopper feed to reduce skill needed

machine tools with their commanding lead in technological developments will continue in demand in those countries having the dollars to pay for them. So let's take a look at present technical trends to see what they offer the user now and within the next few years. You can look for these trends to affect profoundly the new machines to be shown at the Machine-Tool Show in Chicago next September.

The metalworking industry, once simple, is now complex. It requires a tremendous variety of materials to be machined to close tolerances. Many materials are hard to machine, many shapes hard to produce. A major factor has been military demand for the complex sections in high-strength materials required for supersonic aircraft, guided missiles, and in the atomic program.

The T-lathe (LeBlond, Lodge & Shipley, Monarch) was resurrected for this service. Spinning was saved from oblivion, even converted to a mechanized process. Jig boring and precision boring (Ex-Cell-O, Heald) generally became common. Gun drilling and trepanning (boring out a central core) received a decided impetus. Recently, larger and larger machine tools have been produced, some even running on tracks to take care of very long parts. LeBlond is now building a 110-ft. trepanning lathe with a 150-hp. motor on the headstock for trepanning holes up to 40 ft. long and 3 to 20 in. in dia.

Basic trends in machine tools seem to be toward higher speeds (up 50% since World War II), higher feeds to match, wider speed and feed ranges, higher horsepower (up 100% since the war), automatic or semiautomatic control, more contouring, adjustable speed or feed drives for optimum cutting conditions, transfer machines.

Other trends: better chip disposal, greater rigidity and strength, automatic interlocks for accessories such as coolant supply and lubrication, closer temperature control on lubricant and coolant, better and more exact coolants (even with interchangeable tanks for short runs), functional styling without chip-or-dirt-forming pockets or dangerous projections, grouped and duplicated controls, built-in speed and load indicators, automatic gaging and sizing.

The trend to higher speeds is well illustrated by recent sharp advances in broaching speeds. A few years ago, 60 ft. per min. was top speed. Now 150 to 200 ft. per min. is common. Lapointe's latest machines are now up to 300 ft. per min., making them suitable for carbide tooling and thereby reducing product cost, improving product surface finish.

Machining cycles on nearly all types of machine tools have become so efficient that much emphasis is now being placed on reducing loading and unloading time. This development is going in two directions: (1) automation of the single machine and (2) application of transfer or shuttle mechanisms between groups of machines.

Automation, which in its overall meaning may lead to a second industrial revolution, was originally only loading and unloading devices applied to existing established machine-tool equipment. The term, or concept, has now been broadened to include devices between machines and controls for the machines.

But there is no consistency in the use of the term. For example, plant officials of two automotive firms estimate that their 1954 retooling programs for 1955 models consist of 75% new equipment, 20% new tooling, and 5% automation—but this 5% is only the devices installed between machines to move the part automatically from one operation to another. Actually, automation, is included in the 75% because it is now part of the machine design.

Originally an automotive concept, automation is being applied for business machines, electrical appliances, and other mass-produced items. It is also being used in mass-producing components where actual production may not be particularly large.

Transfer machines have been used most extensively for drilling, reaming, tapping, milling, counterboring, and even inspection. The idea is 15 years or more old, but has had its greatest development since World War II. Automotive companies pioneered it, but it has now appeared in automotive accessories, appliances, and similar plants where quantity justifies it.

A warning: don't be too fast to say, "Automation is not for us. It's only for the big automobile plants." High production is not the only factor in deciding to automate part or all of a line. The major consideration is whether it will cut costs.

Much depends, of course, on the cost of automation. While automating a large plant may run to several million dollars, a small plant might be automated for $20,000 to $30,000. Or automation might be applied to a single machine or operation for only several hundred dollars. For example, a loader costing 20% as much as a lathe might double the lathe's output.

In the same way, Micromatic Hone designed for a transmission builder a honing machine with automatic loader, gaging device, and parts segregation. It can hone 200 pinion gears per hr. with one operator on a battery of these machines. Another example is National Broach & Machine Co.'s emphasis on flexible semiautomatic devices for export. One device is its air-powered semiautomatic loader,

SEMIAUTOMATIC UNITS, such as this National Broach & Machine loader, will find greater use overseas

which offers a low-cost method of increasing production rates on rotary gear-shaving machines. A similar, but more automatic, unit is its fully automated device for gear shavers. This unit includes vibratory hopper feed, automatic gages, and automatic loader.

Automatic control has been familiar to engineers for years on automatic screw machines, templet-guided oxyacetylene cutting machines and punch presses, duplicating millers, tracer-controlled lathes, and on fixtures or tables that index to cutting position.

J. M. Jaquard, about 1804, invented a loom controlled by punched cards linked together in a chain. This control system has since been applied to embroidery and lace-making machines and, as a punched tape, to pianos, organs, typewriters, and typesetting machines.

Now the principle is being applied to machine tools to produce limited numbers of parts without elaborate tooling or fixturing and without the necessity of first producing the master or templet required in the contour-following system. Extremely complex pieces can be made from tapes prepared on a computing machine.

Early tapes were planned on a "playback" basis. A machinist ran through the operations to make one piece, and the tape thus produced could be reused. This introduced unnecessary motions, sampling cuts, and human error. A current series of experiments in France may eliminate these drawbacks as it involves use of a "memory" mechanism so the tape is not punched until all desired conditions are reached.

The development of the servomechanism and computers for military purposes in the last 20 years has brought reliable electronic equipment and the basic knowledge for computing a control tape without making a first piece. Tape-controlled machines, using a punched tape, are now under development.

One numerically controlled milling machine, already in use at Massachusetts Institute of Technology, is accurate to 0.0005 in. An experimental tape-controlled lathe of several years ago was accurate to 0.0002 in. in diameter. A gear shaper, controlled by dots projected from a 16-mm. movie film, is making noncircular gears, extremely difficult to produce by any other means. And one machine (National Advisory Committee for Aeronautics) has made jet-turbine blades and other complex forms under control of punched cards worked out on a computer.

Tape or card control is not in the dim future. It is in the *very near future* for machine tools, but it is easier to apply to punch presses, cutting torches, and similar equipment, on which tolerances are not so close and motions are simpler. Three tapes (metal) control a press brake for forming wing skins at Douglas Aircraft Co; a punched motion-picture film controls a riveting machine at Consolidated Vultee Aircraft Corp.

Machine tools are steadily improving in design too. Among changes that might be mentioned are the application of hardened and ground ways on lathes and similar machines, of plastic ways on planers and boring mills, of preloaded bearings and anti-friction bearings on spindles. Materials are selected for particular service conditions.

Units have individual motors, often a motor for each movement, and incorporate devices for preselection of the next speed or feed and for rapid speed or feed changes while the machine is operating. Multiple tooling, multiple spindling, duplicated fixtures or tables, drum or dial feeds, rapid approach and return, and many other ideas have been applied to reduce the time spent by costly machine tools in "cutting air."

While such processes as trepanning and gun drilling have been revived and tremendously expanded in recent years, utterly new cutting processes are also being applied. These include:

• **Electrolytic grinding.** Electrical discharge breaks down a hard material like carbide so a grinding wheel can remove it much more easily. Results: metal removal six times as fast, wheel wear as low as 1% of former methods.

• **Electrical-discharge machining** (also formerly called "arc machining," "spark machining," etc.). An electrical discharge under an electrolyte breaks down any hard metal and cuts it away. The "cutting tool" can be brass. Result: intricate shapes can be cut in carbides or highly alloyed hardened steels.

AUTOMATION for single machines, as on Micromatic Hone's Microhoner, does not need complete plant overhaul

• **Abrasive blast.** An abrasive, entrained in an air stream, is jetted at high speed against the piece to be cut. Developed for dentistry, this process can cut ceramics and brittle hard materials.

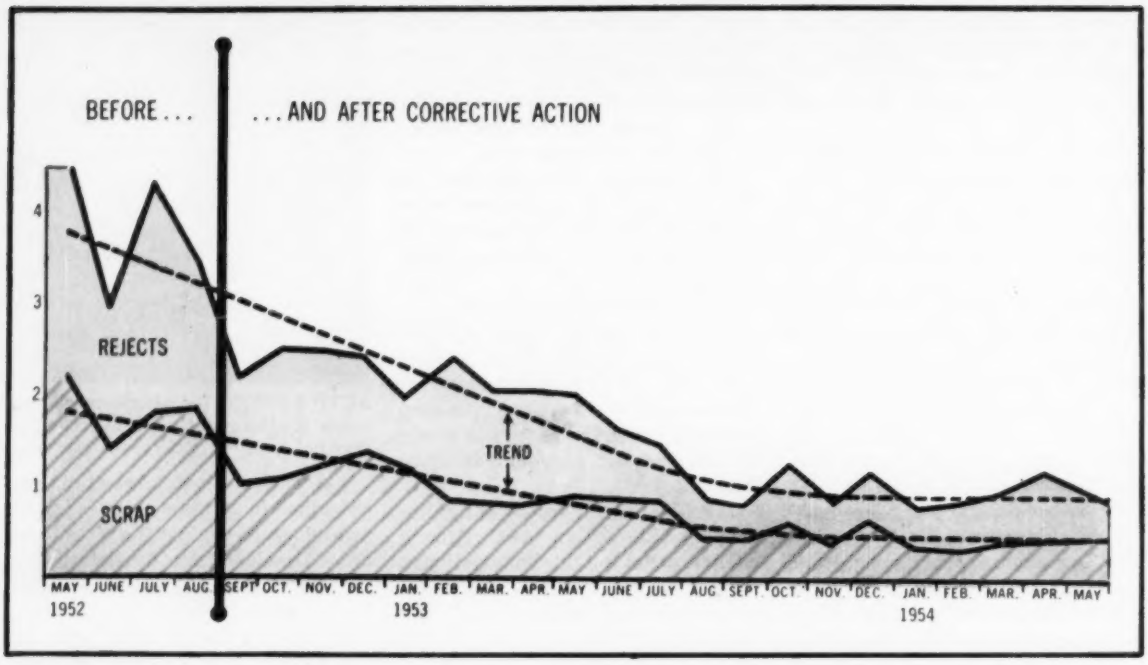
• **Abrasive belt.** The past 15 years have converted this process, once only a polishing method, to a status competitive with grinding, particularly of compound-curved shapes such as turbine buckets.

• **Electro-machining.** One type is similar to etching of designs on glass or steel, which removes unwanted metal by acid or alkali etching; the other is similar to the process of making electrotype plates, which puts metal where it is wanted by electrodeposition.

• **Ultrasonics.** The master, of soft metal to any desired shape, is vibrated in an ultrasonic-energy tool (Raytheon Mfg. Co.) at ultrasonic speed (19,000 to 29,000 cycles per sec.) and small amplitude (0.001 in. or so) over the work, with a slurry of boron carbide and water between. Carbides, jewels, glass, stone, quartz can be cut rapidly, and any desired shape attained, even a corkscrew hole.

Next Month . . .

. . . we'll bring you more on machine tools, particularly European. Development in Europe has taken a somewhat different path—more toward flexibility in batch-type application and tooling, plus high output potential comparable to specialized machines. This article will further emphasize the benefits that modern machine tools can bring to your firm.



SHARP DROPS in both reject and scrap rates occurred when Beech Aircraft started its corrective-action program

Program Cuts Rejects 77%

Six simple steps in a corrective-action program produce some striking and important results in one company's drive for first-class quality control

THE CHART shows the trend in quality control at Beech Aircraft Corp., Wichita, Kansas. Credit for the sharp drop in reject and scrap rates goes to the company's new program for corrective action in quality control. Its program resulted from an analysis of what was needed to produce, at minimum cost, a high-quality product that conformed to contracts and specifications.

Detailed results of the corrective-action plan look like this:

- Beech Aircraft's rejection rate dropped 77%—from an average of 3.8% for the 4-month period, May to August 1952, to an average of 0.88% for the 10-month period, August 1953 to May 1954.
- Its scrap rate dropped 79% for the same periods.
- Inspection costs were cut 64% while deliveries dropped only 20%.
- Customer complaints per unit dropped more than 50% in the last year.
- Warranty claims on commercial products dropped 12.5%.

The heart of the system is a "corrective-action committee." Its members: a representative each from quality control (chairman), tooling, engineering, manufacturing, purchasing, production, and customer-service departments. A discussion of the six steps in the corrective-action program follow:

1. Tracing the causes of recurrent errors. Beech Aircraft summarizes information from individual rejection reports on punched business-machine cards. These cards are sorted and tabulated daily to uncover parts that are frequently rejected for the same cause. The corrective-action committee studies a weekly report made from the daily tabulations.

The quality-control department prepares reports that show details of rejections and quality variations. Then material review board decides on disposition of parts and assigns responsibility for errors.

2. Assigning responsibility for corrective action. The corrective-action committee next assigns departmental responsibility for curing the cause of these recurring troubles. The selected department must initiate a corrective-action program.

3. Following up to insure continued quality improvement. The committee also watches all future production of items with recurrent rejection problems. A follow-up record is maintained.

The quality-control department has several devices to insure continued corrective action. Here are a few examples:

- Inspection instruction cards that show with pictures the critical dimensions or problems.
- Warning tags on critical parts. Tag shows part number; says, "Fabricate carefully! These parts have a high rejection rate."
- Inspectors' information sheets that list recurrent complaints on parts.
- Warning sheets that show why last order was rejected and how many parts out of the number pro-

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duced contained the discrepancy.

4. Stimulating workers to improve manufacturing quality. Maintaining operator interest in quality production is the most dramatic aspect of corrective-action. Beech Aircraft uses posters, animated booklets, time-card slogans, cartoons, and quality awards. In addition, it has departmental quality ratings for comparing production between departments.

5. Measuring customer acceptance of quality. The most important objective of quality control is to provide a maximum of customer acceptance and satisfaction. The company maintains continuing records that compare customer complaints with those of its own inspectors.

All customer complaints are recorded on punched cards for analysis. The corrective-action committee gets a list of all active recurrences for processing.

The basic measures of customer acceptance are supplemented with periodic spot-check evaluations of complaints for various parts of the product. By charting these trends, Beech Aircraft tells how well its quality control compares with customer requirements for quality. And it can then locate and balance differences to make sure it is meeting its quality objectives.

6. Evaluating product quality-control progress. The company maintains a continuous program for evaluating its product quality control. This includes monthly charting of:

- Average rejections and scrap rates.
- Complaint trends in fabrication and assembly shops.
- Customer complaints, comments, and warranty adjustments.

These families of charts are analyzed together to determine how well the company is doing. The committee uses this information to plan additional over-all corrective-action. A regular inspection surveillance program also measures the effectiveness of each inspection department. Each of its 35 inspection departments is rated each month according to satisfactory control, minor or major discrepancies. — Factory, Oct, p102

Plastic Vapor Barrier Has Unusual Features

Condensation control is a must in good house design. A good vapor barrier applied correctly can stop damage caused by excessive moisture. Newest vapor-barrier material is polyethylene film, made by Visking Corp., Terre Haute, Ind. It will not crack or deteriorate with age, is soft and tear resistant, and can be applied at temperatures well below freezing. Its weight is negligible; 210 sq. ft., 0.001 in. thick, weighs 1 lb.

A 0.004-in.-thick film is recommended for use as a vapor barrier under concrete slabs. The subgrade is first smoothed, and film is laid with 6-in. laps. Weight of the slab seals the joint.

Walls and ceilings should be vapor-proofed with 0.002-in.-thick film. Joints occur over solid backing with a minimum lap of 3 in.

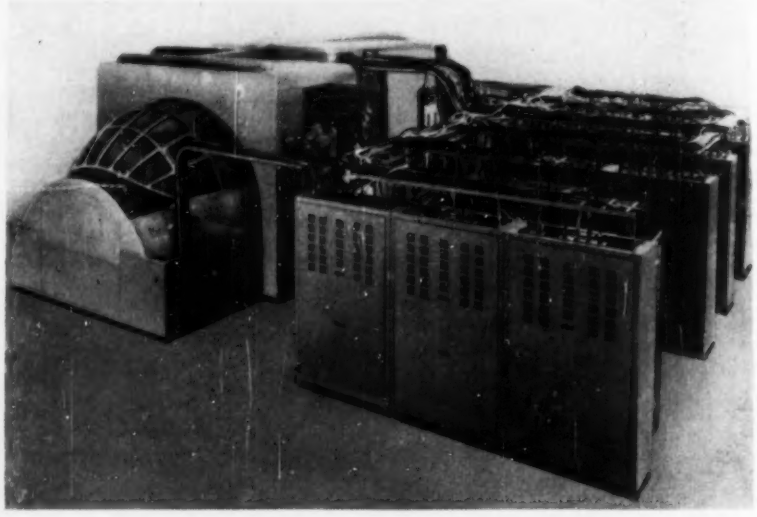
The film can also be applied to foundation walls. It can be placed against the outside of the walls before backfilling. Or it can be placed on the inside of forms before pouring. This way it acts as a form liner that permits slow curing of the concrete while allowing early removal of the forms.—Am Builder, Oct, p229

New Paper-Sling Pallet Carries Ton Weights

A new type of materials-handling pallet that weighs less than 3 lb. and supports a load of nearly 2,000 lb. has been developed by American Cyanamid Co.

A paper sheet serves as a sling for the load. The paper is a 90-lb. kraft containing melamine resin for added strength. Two ends of the sheet are folded back and bonded with a wide strip of glue, leaving an opening at each end for insertion of chipboard tubes.

Strain on the pallet is relieved by stacking patterns that distribute the over-all weight. New-type bayonet forks, readily attachable to any present type of fork-lift truck, slip into the tubes for lifting the palletized load. Loads can be lifted, carried, and stacked in single-, double- or triple-decked tiers without removal of the pallet. —Mod Packaging, Sept, p120



New Flight Simulator for Giant USAF Planes

This is one of a series of new flight simulators for mammoth ten-engine B-36 aircraft now being built for the U.S. Air Force by the Electronics Division of Curtiss-Wright Corp. It contains 2,600,000 ft. (500 miles) of wire, 1,200 vacuum tubes, 800 potentiometers, and 250 servomechanisms. The simulator occupies a 40x40x14-ft. area. It incorporates a 10-to-1 switch, which accelerates fuel depletion rate so that long flights can be synthetically shortened, compressing a day's operation into 2½ hr.—Aviation Wk, Sept 6, p57

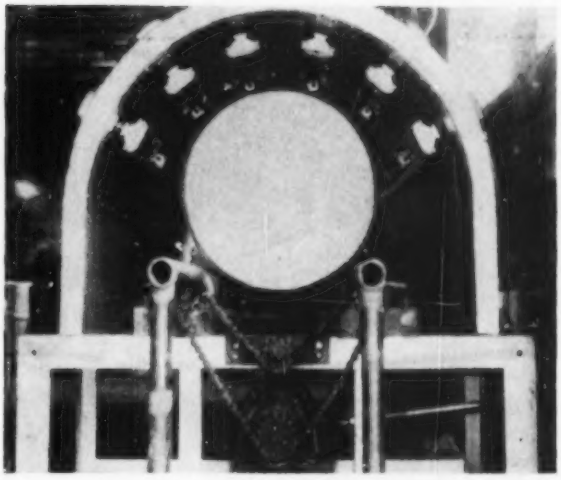
New Ideas Tell How To . . .

. . . cut paint-drying time

Preheating steel barrels in a radiant infrared tunnel —a method applicable to many other metal products —has cut paint-drying time from between 3 and 4 hr. to 15 min. at the Barrel Remodeling Co., Kansas City, Missouri.

Rotated on rollers in a six-unit infrared tunnel, reclaimed barrels are heated to 175°F. in 30 sec. They are then placed on end-spinners in the spray booth to ensure an even coating.

Process dries paint "from the inside out." Paint adheres well without blistering. Heating also saves considerable paint by reducing its viscosity, thereby permitting a given quantity to cover a larger area. —Elec World, Oct 4, p108



. . . check liquid level accurately

Plenty of instruments are on the market to measure liquid levels in storage tanks, but Gilbert & Barker Mfg. Co., (West Springfield, Mass.) felt there was need for a more accurate one.

The company's new instrument checks the liquid level within 1/16 in. It works independently of temperature or viscosity of the liquid. Electronic signals operate a servo-motor, which raises or lowers a sensing element as the liquid level moves. Information is carried to operator on a remote null-balance receiver. —Chem Wk, Oct 2, p105

. . . locate electrical grounds

Ford Aircraft's electrical ground-detecting system can pinpoint a ground fault in minutes this way:

1. Ground-indicating lights are mounted above each power distribution bus duct. Dim light or no light indicates ground in duct or equipment fed by it. Numbers under lights indicate substations.

2. An impulse signal is introduced into circuit that feeds circuit breakers of substation. Micro-ammeter, passed along front of substation, detects signal at breaker in faulted-cable circuit.

3. Second set of grounding lights on substation indicate which of three phases is grounded.

4. Electrician follows bus with micro-ammeter until signal disappears. Backtracking on bus to last switch and through switch to machine uncovers the fault.— Factory, Oct, p126

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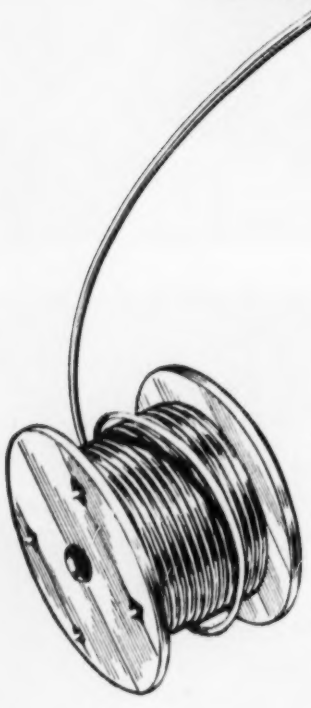

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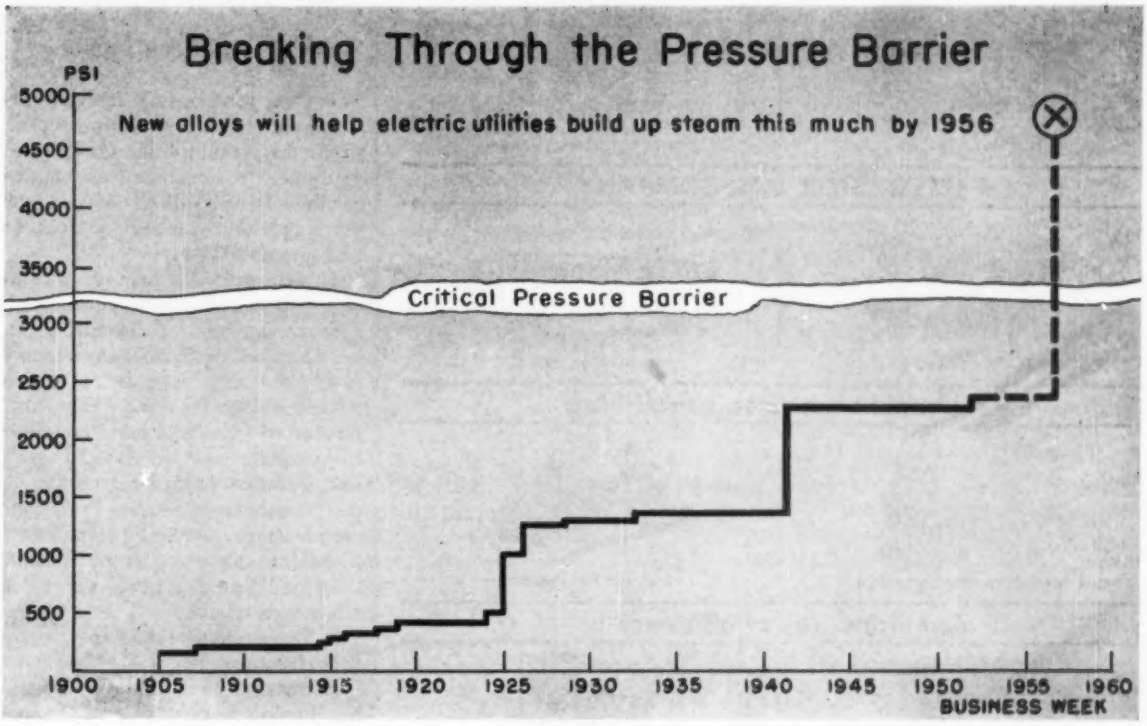


For Cheaper Steam Power

A FUNDAMENTAL PRINCIPLE of thermodynamics is that the higher the temperature of the source of energy and the lower the temperature of the region to which you reject waste energy, the more work you can get out of a given amount of energy.

But when steam gets hotter, the pressure goes up and you have to build stronger equipment. Now, after a period in which metals have held steam pressures and temperatures on a plateau, U. S. engineers in the power field are about to make another huge jump. They are readying plants to beat the critical pressure barrier (chart), which hitherto has limited pressures and temperatures.

Two groups are involved:

1. **Philadelphia Electric Co.** is planning to build "the world's most efficient power station"—a $45-million unit with a 275,000-kw. super-pressure turbine-generator unit made by Westinghouse Electric Corp.

The plant will operate on steam at 5,000 lb. per sq. in. and 1,200° F., the highest pressure and temperature ever projected. Two reheat stages will be at 1,050° F. Expected plant heat rate is 8,400 Btu. per kw. hr.—660 Btu. less than previous best rates.

The boiler will be a Combustion Engineering Sulzer Monotube steam generator of the once-through type employing forced circulation. It will feature automatic oil-hydraulic-type controls developed by Sulzer Brothers Ltd., Winterthur, Switzerland.

2. **Ohio Power Co.,** a unit of the American Gas & Electric system, is building the first commercial supercritical plant (McG-H Digest, Sept '53, p30). Smaller than the one for Philadelphia, it will have a 125,000-kw. generator and operate at 4,500 lb. per sq. in. and 1,150° F. General Electric Co. is building the turbine generator; Babcock and Wilcox Co., the steam generator; and De Laval Steam Turbine Co., the boiler feed. The plant should be ready by 1956.

There are several reasons why the pressure and temperature jumps are being made now. One is the industry's relentless drive toward cheaper power; this will be helped by lower fuel costs in the new plants. Another is the availability of new special alloys for withstanding the high heat and pressure.

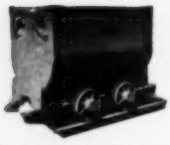
These new alloys permit conquest of the critical-pressure barrier. It's all a matter of how water and steam behave.

In conventional units, the steam that enters the turbine is a dry gas. The particles of water in it have been spun off in a drum called a separator.

But as pressure increases in a boiler, a cubic foot of water weighs less and less while a cubic foot of steam weighs more and more. When the pressure reaches 3,206 lb. per sq. in. (the critical pressure), water and steam weigh the same and will not separate.

Therefore, a once-through type of boiler, eliminating the separating drum, must be used in super-pressure units such as those described above.—Business Wk, Sept 18, p41; Power, Sept, p73; Elec World, Aug 30, p6 and Sept 6, p82

Mainline Freight Cars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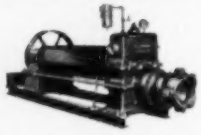
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Eight Ways Tell How To Save Office Equipment

There's a good possibility your investment in office equipment is high. So perhaps some thought on equipment management and maintenance is advisable. These eight ways can help you save equipment and improve its use.

1. **Schedule** the use of equipment. By scheduling equipment, greater economy of operation can be attained with less investment than if each department were equipped with full-load equipment, part of which would be idle during the month.

2. **Provide** proper maintenance. Large companies provide their own maintenance. For small companies, a maintenance contract placed with equipment manufacturers is most economical.

3. **Train** employees in the proper use of equipment.

4. **Survey** each system before purchasing equipment. The machine should fit the system and not the system fit the machine.

5. **Centralize** office functions of a related nature. Office equipment, to do its best work, requires volume.

6. **Standardize** on kind, size, and type of equipment.

7. **Develop** a "pay out" policy for purchase of new equipment. Any investment in new equipment (initial or replacement) is justified if the savings from the machine will return the original investment in 2 to 5 years.

8. **Take** an inventory of all equipment once each year.—Am Business, Sept, p24

Better Plating Anodes

Engineers at American Brass Co. have discovered that adding 0.2 to 0.3% phosphorus to pure electrolytic copper gives anodes that deposit 10 to 15% more copper on the work. This discovery contradicts the traditional theory that the higher the anode purity, the better the plating quality.

Phosphorized copper anodes give freedom from anode sludge, no copper build-up in solution, and exceptionally smooth, heavy deposits. Scrap losses are low.—Chem Eng, Oct, p124

Concrete Piling Halves Pump-Foundation Costs

Less concrete, lower excavation costs, elimination of large forms, faster construction—these advantages were gained by Great Southern Chemical Corp.'s (Corpus Christi, Texas) mounting pumps and small vessels on concrete piling. It more than halved foundation costs.

The method involved the pouring of concrete into holes to form two or three reinforced pilings and then pouring a surface mat to support each pump. This replaced solid blocks of concrete.

Holes were dug about 9 ft. below grade. A ream augur widened a part of each hole, at a specified depth, to increase actual bearing surface. Depth of widening to bell shape (2 ft. for 1-ft. shafts) depended on soil stratum, with bearing surface increased at the most stable stratum.

Vertical reinforcing rods, usually four inserted in each hole, varied in diameter according to the load. Most common size was ⅝ in. Rods, tied together with circumferential rods spaced 9 in. apart, extended upward into the block excavation.

Holes were then poured and allowed to set for 24 to 48 hr. before the foundation mat was poured. Mats varied in size according to pump size, but were all poured 2 ft. deep.—Oil & Gas J, Oct 4, p138

Chemical Developments

• **Unique package** is carrying a new insecticide to market. It is a polyvinyl alcohol film pack that dissolves in cold water in 3 sec. Other uses forecast are chemicals of many types, detergents, and frozen foods. Dumont Enterprises collaborated with Reynolds Metals Co. and Renflo Chemical Co. in developing the package.—Aug 28, p82

• **Polyurethane foams** are reaching the market in the U. S. Developed in Germany, they have been widely used in Europe for table covers, sponges, brushes, pad upholstery, mattresses, garment insulation, soundproofing, filters. Several companies are rushing into production. —Sept 4, p82

• **Fiber glass** reinforces a new structural material developed by U. S. Navy. As glass filaments emerge from the furnace, they are individually coated with inorganic and metallic substances (iron, nickel, molybdenum, aluminum, zinc). Coated fibers are bonded and compacted into laminates or formed into tubular shape. One possible use: tubing for processing industries.—Chem Wk, Sept 11, p42

Electronic Tractors

New electronic control system speeds in-plant materials handling with tractor trains, using radio signals to produce the same effect as that of the old-time milkman directing an occasional whistle to his wagon horse.

A warehouseman loading groceries and supplies onto a tractor-train need touch the tractor controls only occasionally. To move from dry cereals to soap powders, he merely pushes one of three buttons.

Three different tone signals whistle the tractor to start, turn right, or turn left. When his finger is removed, tractor brakes to a smooth halt. Time studies indicate savings up to 20% in an order-filler's time.—Electronics, Oct, p6

New Drip-Feed Process Gas-Carburizes Steel

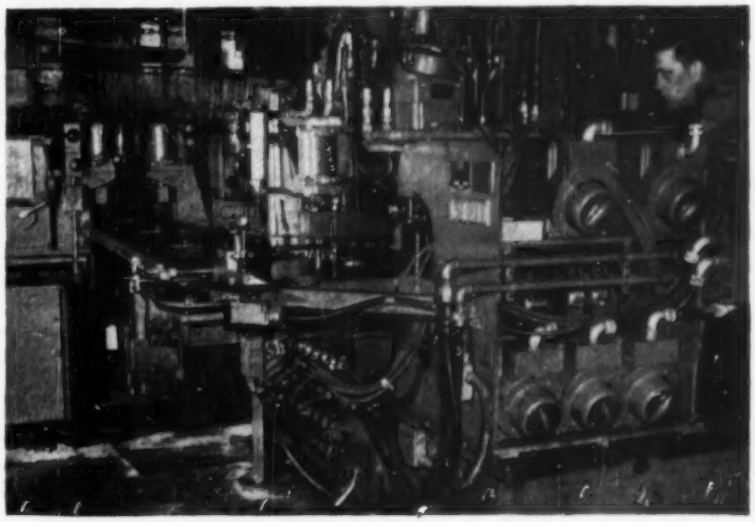
The Carbodrip drip-feed process has been developed by Wild-Barfield Electric Furnaces, Ltd., Watford By-Pass, Herts, England. It permits gas carburizing of steel products where manufactured or natural gas is not available.

The process drips a suitable liquid mixture directly into the carburizing furnace chamber to produce a reducing atmosphere containing carbon monoxide, methane, and hydrogen. Carbon dioxide, oxygen, and water vapor are held to a minimum. The atmosphere is also free of sulfur compounds.

Furnaces, available in two sizes, are of vertical design. A liner provides a positive, clamped seal at the top and a chromium-ore seal at the bottom. The door is raised hydraulically.

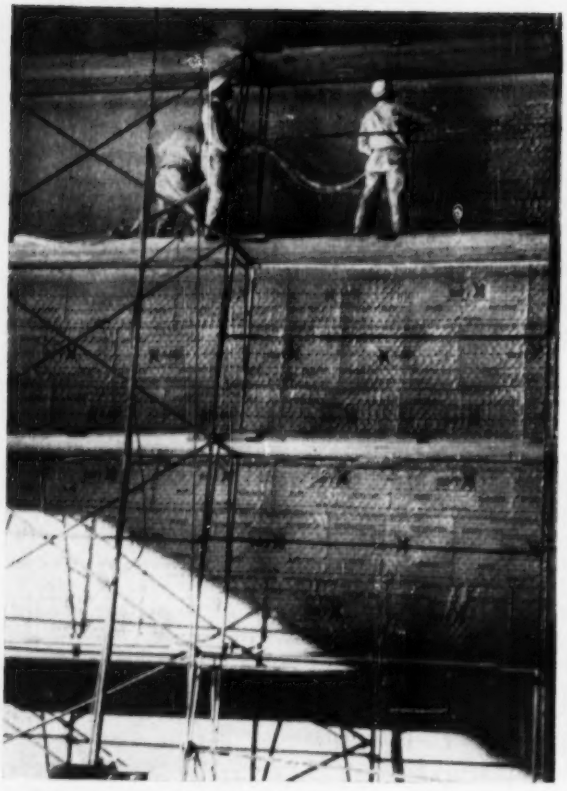
Compressed air delivers Carbodrip liquid to the furnace. An indicating flowmeter measures the amount of liquid being fed.

The equipment may also be used for carbonitriding. Anhydrous ammonia may be supplied directly to the furnace or mixed with the drip-feed liquor.—Mach, Oct 8, p1781

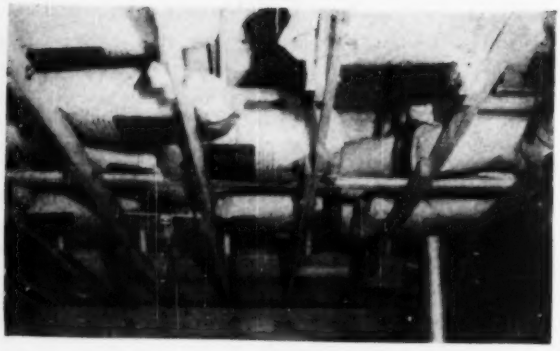


Dual-Purpose Welder Doubles Door Output

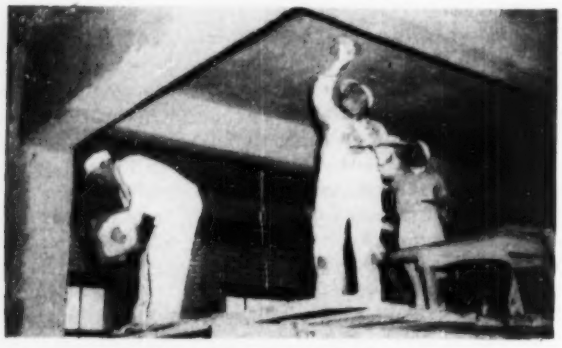
Specially built dual projection and spot welder increased production of kitchen cabinet and stove doors by 100% at Kaiser Metal Products Co. One side of machine is a 400-kva. cam projection welder, the other a 495-kva. multiple spot welder. After projection welding, doors travel on an L-shaped track to the other side of the machine and are automatically fed to the spot welder. Ejection is also mechanical.—Weld Eng, Sept, p28



VERMICULITE PLASTER is applied rapidly by machine to mammoth firewall in huge warehouse



INSULATION in bags, laid across joists before ceiling is built, is poured and leveled later



FIREPROOFING PLASTER is light-weight, goes on fast over metal lath without tiring men

Vermiculite: Its Uses Grow

Unusual features open up many possibilities for expanded vermiculite in building construction. Versatile material insulates, fireproofs, saves weight

MANY USES for expanded vermiculite are appearing in construction—particularly in lightweight structures and their fireproofing. Vermiculite is a micaceous mineral with a fusion point of 2,200° to 2,400°F.

The finished product is made by heating milled and sized flakes of vermiculite ore to 2,000°F. This releases water molecules present between the layers, causing them to separate and move apart. Each flake expands to about 12 times its original size, trapping thousands of dead air insulation cells.

Granular structure, incombustibility, lightweight, and low thermal conductance are expanded-vermiculite's main characteristics. Its main uses in construction are as an aggregate replacing sand in plaster and concrete, as a component of acoustical plaster, and as fill insulation.

Vermiculite aggregate permits large reductions in dead load and in structural steel requirements. In a 70x150-ft., three-story California office building, 60 tons of structural steel were eliminated. Cost of footings was reduced $7,000. Although only 25,000 sq. ft. of sound control were required, an additional $12,500 was saved by integrating the acoustical treatment with the plaster fireproofing.

Vermiculite-gypsum plaster is mixed and applied like sand plaster. Five 4-cu. ft. bags, weighing 32 lb. each, replace 2,000 lb. of sand. Bagged aggregate makes it easier to proportion and the plaster is less apt to be mixed lean. It is uniform in size and quality and is relatively free from foreign matter.

Vermiculite aggregate eliminates the labor of breaking up and thawing out a frozen sand pile in winter. Mixing can be done inside the building on any floor with no danger of overloading floor supports.

Vermiculite plaster has good workability and "hangs on" well while setting. One inch of vermiculite-plaster fireproofing with its reinforcing and supporting channels weighs only 4 to 5 lb. per sq. ft. The finished plaster is resilient.

Vermiculite concrete is a mixture of portland cement, vermiculite concrete aggregate, and water. Weight, strength, and thermal conductivity depend on the ratio of portland cement to aggregate. A 1:4 mix with 12 gal. of water has a density of 35 lb. per cu. ft., a compressive strength of 325 lb., and a "K" factor of 0.97.

The material has good fire resistance. An exploratory test made on a slab 3 in. thick showed that after a 4-hr. exposure to a flame temperature of 2,000°F., the cold side of the slab reached only 186°F.

Job-mixed vermiculite concrete is prepared in a mechanical mixer, preferably of the paddle type that has a stationary drum with rotating paddles. The concrete is mixed for 3 min. and placed immediately.

When transit-mixed, all water, cement, and aggregate are placed in the mixer in this order. The drum is turned only enough to obtain a uniform mix, and is not turned en route to the site. There, the batch is remixed for approximately 1 min.

As roof insulation, vermiculite concrete has gained recognition as an efficient, incombustible material. It does not rot or disintegrate. There are no joints to open up. It is not damaged by exposure to weather before built-up roofing can be applied.

A 1:4 mix is poured over paper-backed wire lath, high-rib metal lath, or vented sheet steel. It is also placed over form boards supported by sub-purlins. A 1:6 mix is used as a fill over a structural roof deck and as an insulating slab for grade-level floors, radiant-heat floors, and snow melters.

Floors-on-ground should be laid over a stable, well-drained, properly graded earth base and a 4-in. gravel fill thoroughly tamped. When required, because of ground-water conditions, a membrane waterproofing should be applied over a grout coat of portland cement placed over the gravel fill. The vermiculite concrete is placed over this vapor barrier to a minimum thickness of 3 in., and is covered with a sand-concrete topping.

If radiant-heat pipes, ducts, or electric cables are incorporated, they are laid on top of the vermiculite slab and covered with sand-concrete. Minimum topping is 2 in.

Vermiculite loose-fill insulation does a good job of insulating attics, lofts, and side-walls. It does not decompose or rot, cannot be tunneled by rodents or other vermin. It does not irritate the skin or lungs, and presents no silicosis hazard.—Const Meth & Equip, Oct, p74

International Business Briefs

Cairo—The Near East's biggest power plant, "Cairo South," will be built here in 1955-58 by four German firms—AEG, Siemens, Walter and Co. (Koeln-Delbrueck) and Steinmueller (Gummersbach). The 135,000-kw. plant will use $10-million of equipment and will serve as the basic power plant for Egypt's capital and the nearby Heluan industrial area.

Buenos Aires—Production of 40,000 cars, jeeps, and trucks annually in Argentina within 3 years is the goal of Henry J. Kaiser, U. S. industrialist, under an agreement setting up a new company owned 51% by Argentine government and and 49% by private Argentine investors. Its $10-million of equipment will consist largely of machinery used to produce discontinued Henry J cars at Willow Run factory, Detroit.

Tokyo—Two giant 45,000 tankers costing $5-million each will be built by Mitsubishi Shipbuilding and Engineering Co. here for the U. S. firm, Tide Water Associated Oil Co., San Francisco . . . Under a 10-year technical assistance agreement, the Tokyo Shibaura Electric Co., Japan's biggest bulb maker, will help expand output of India's Bengal Electric Bulb Co. by supplying technical and engineering information in exchange for 2% royalties.

Amsterdam—The U. S. General Tire and Rubber Co.'s new factory here expects to be turning out 100,000 tires and 80,000 tubes annually by mid-1955, mostly for export to Benelux countries.

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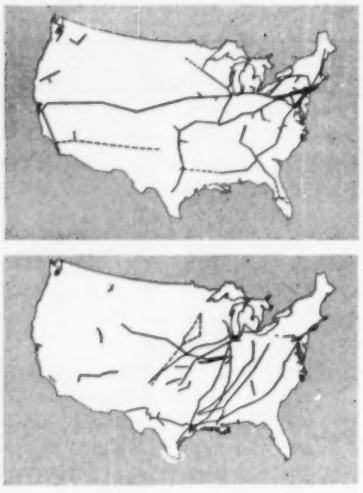
MICROWAVE reflector atop steel tower symbolizes communications age



TOP: Common-carrier crosses U.S.
BOTTOM: Oil-gas line serves industry

Microwave Expansion

IN 2 YEARS, point-to-point communication by microwave in the U. S. has jumped over 50%—from under 20,000 route miles to nearly 30,000.

Today there are 93 civilian microwave systems with 1,367 individual stations. The chief users: common-carrier (telephone and telegraph) firms, private concerns, and the military. Frequency bands range from 952-960 to 12,700-13,200 megacycles.

Two important properties provided by the short wavelength of microwaves (30 cm. and less) are responsible for the expansion:

1. Transmissions follow a line-of-sight path (average distance between towers is 20 miles) and can be focused much like a beam of light by high-gain antennas. Nearby systems can operate in the same frequency band without interference.

2. A circuit's physical dimensions determine its electrical parameters, and for such short wavelengths a small change in circuit dimensions can produce a wide frequency variation. Microwave equipment can have an extremely wide frequency-band width compared to low-frequency equipment (systems providing 24 voice channels are widely used; common carriers may have several hundred voice channels).

In the two years from 1952 to 1954, telephone-telegraph company route mileage has more than doubled. Stretching from coast to coast, it exceeds 13,000 miles.

A major impetus has been the need to connect television stations for intercity network service. There are today 194 microwave studio-transmitter links and 43 stations used for intercity transmission of television signals.

Another kind of common carrier recently appeared when a Missouri group was authorized to build a microwave system to distribute television signals captured from the air to remote community antenna cable systems.

Gas and oil pipe-line firms, with 10,679 miles, have two-thirds of the route mileage of private systems. For these firms, microwave avoids the problems of securing rights to string pole lines and offers more dependable service.

Power utilities operate about one-quarter of all private microwave. Railroads are considered large potential users. Microwave for police communications is going hand-in-hand with the building of new superturnpikes such as the Pennsylvania, New Jersey and Ohio roads.

Many military microwave systems have been established both in the U. S. and abroad to link headquarters and other installations—Electronics, Oct, p152

Make Welding Safer by These Few Rules

Nasty explosions and fires have been caused by welding of supposedly empty tanks that have held combustibles, such as gasoline. You can prevent them in your plant by enforcing a few rules.

1. **Insist** that the tank be cleaned properly before welding. If the tank has held a water-soluble combustible, as alcohol or acetone, washing with water will clean it. For gasoline or oil tanks, a hot chemical solution is necessary. Chemicals generally used are sodium silicate or trisodium phosphate (washing soda). Procedure: flush tank with water, add hot chemical solution, admit steam into tank for 15 to 20 min.

2. **Make sure** during cleaning, if container has held a toxic gas, that men wear oxygen masks or have adequate ventilation. Outdoor cleaning is preferred.

3. **Provide** suitable goggles, gloves, other safety clothing for men handling chemicals.

4. **Insist** that cleaning men remove from vicinity all sources of ignition before cleaning is started.

5. **Install** a system whereby each cleaned container is tagged or stencilled as safe for welding, together with signature of person so certifying and the date.

6. **Make sure,** for extra safety, that the container is filled with water or an inert gas before and during welding.—Weld Eng, Oct, p41

Deep-Mine Loader

Two underground-type mobile loaders load coal at the Sequoyah strip mine, Rogers County Coal Corp., Okla. Overburden ranges from 9 ft. to the stripping limit of 50 ft. An electric shovel with a 20-yd. dipper uncovers the coal.

Twin pinning machines, carrying 4,000-lb. weights and mounted on crawler tractors, break the coal for easy loading. These machines operate immediately in front of the loading machines. Two Joy underground-type loading machines mounted on crawlers load coal into tractor-trailer haulage units for transportation to the tipple. The loader's booms have been extended 20 ft.—Coal Age, Oct, p100

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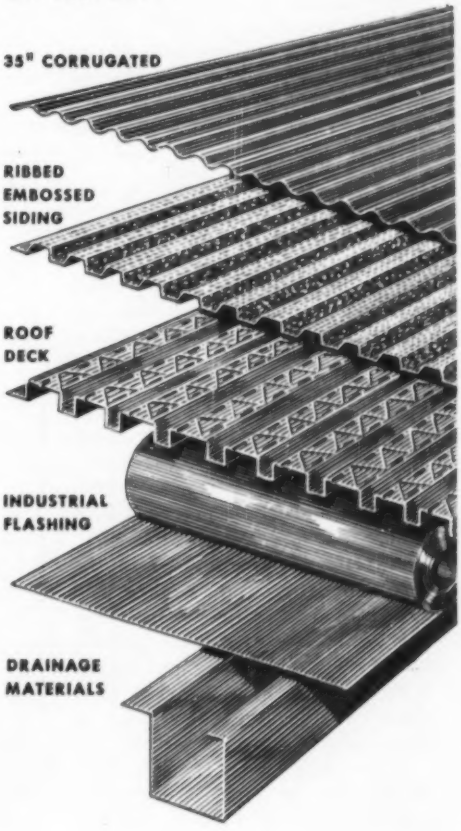

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Ion-Exchange Operation . . .

. . . has been under-rated, even neglected in the past but new materials and developments extend its usefulness to a wide variety of applications

REMARKABLE ADVANCES in ion-exchange technology have been made since the first synthetic exchange resin was made in 1935. This unit operation can be credited directly for the high quality of many familiar products—television tubes, glycerine, streptomycin, sugar, storage batteries, paper, dyes. Current use ranges from demineralization of tap water in a disposable cartridge (for household steam irons) to softening of 80-million gal. of river water per day (for Los Angeles).

Ion exchange is essentially the purification of a liquid by interchange of ions between liquid and a solid. The phenomenon, known for a century, permits the replacement of ionic impurities or recovery of desired ions from an otherwise non-ionic solution.

• **Ion-Exchange Uses**—What can ion exchange do? It performs yeoman service in many diversified fields. In industrial water treatment alone, it demineralizes, reduces alkalinity, removes silica. And it plays an important role in removal and recovery of metals, acids, and bases; separation of ions; de-ashing of organics; catalysis of chemical reactions; removal of impurities from non-aqueous solutions such as liquid ammonia, acetone, and benzene.

• **Exchange Materials**—With the exception of inorganic zeolites and sulfonated coal, all commercial exchangers are based on synthetic resins. The four principal manufacturers (Chemical Process, Dow Chemical, Permutit, and Rohm & Haas) offer a wide assortment.

Exchangers are either cationic or anionic as required. Of the cations, the high-capacity sulfonated styrene resins are the most widely used. Zeolites are applied extensively in water softening. Sulfonated coal is an improvement over zeolites as it can be regenerated. Carboxylic acid resins are used principally in the exchange of large organic ions like streptomycin and for reducing excess alkalinity; their capacity is highest among cation exchangers. Phosphonic acid resins are intermediate in strength between sulfonated and carboxylic types.

All anion exchangers are synthetic resin amines. In demineralization applications, a weak-base exchanger processes the effluent from a strong cation resin bed. Strong-base exchangers will remove acids as weak as silicic and can be used for salt-splitting.

Designations, Type I and Type II, in the table refer to different classes of amine substituents on the polystyrene structure. Type I resins can withstand higher temperatures than Type II.

• **Batch Exchange**—Simplest, first developed, and least used, batch processing requires (1) separation of resin and solution after exchange is completed and (2) usually more than one-step operation.

Commercial applications include one recovering pectin from grapefruit peel. Another can recover gold from cyanide solutions of a leach pulp prepared from ore.

Fixed-Bed Equipment
(Partial List)

Company	Industrial Softeners	Demineralizers	Mixed Beds
American Water Softener Co.	x	x	x
Automatic Pump & Softener Corp.	x	x	x
Barnstead Still & Sterilizer Co.		x	x
Chemical Equipment of Calif.	x		
Cochrane Corp.	x	x	x
Cullisan, Inc.	x	x	x
Dearborn Chemical Co.	x	x	x
The Dorr Co.	x	x	x
Elgin Softener Corp.	x	x	x
Enley Products, Inc.		x	x
Graver Tank & Mfg. Co., Inc.	x	x	x
Hungerford & Terry, Inc.	x	x	x
Illinois Water Treatment Co.	x	x	x
Industrial Filter & Pump Mfg. Co.	x	x	x
Infilco, Inc.	x	x	x
Los Angeles Water Softener Co., Inc.	x	x	x
Oshkosh Filter & Softener Co.	x	x	x
Penfield Mfg. Co.	x	x	x
Permutit Co.	x	x	x
Stover Water Softener Co.	x		
Weston Filter Co.	x	x	
Wolcott Water Softeners	x	x	x
Worthington Corp.	x	x	x

Applications for fixed-bed exchange are many. Major ones include: (1) water softening, dealkalization, and demineralization, (2) metals recovery, (3) organic purifications. There are as many process modifications as there are purification requirements.

For example, ordinary softening can be achieved with a sodium-regenerated cation resin but this does not reduce total dissolved solids. So for a high-quality product, as feedwater in high-pressure boilers, a combination of a hot lime treatment step, followed by use of sodium-regenerated resin, is rapidly gaining favor. Advantages include low operating costs, zero hardness in effluent, ease of process control.

Demineralizing can be done in a mixed bed containing a mixture of cation and anion resins. This method results in more nearly complete removal of minerals than does treating alternately with cation and anion resins. Use of the purified water: high-pressure boilers, coating phosphors on television picture tubes, pharmaceuticals. Conventional fixed-bed exchange is less expensive.

Metals recovery by ion exchange is important for industrial wastes. Examples: removal of aluminum from anodizing solutions; removal of iron, copper, and zinc from chromium plating baths; recovery of copper from cupra-ammonium rayon wastes; recovery of zinc

• **Fixed-Bed Exchange**—At present, the ion-exchange industry utilizes fixed-bed operations almost exclusively, although a trend toward continuous ion exchange is evident. The term "fixed bed" means the use of a packed column of resin to process a solution in a cyclic manner.

At least two units are usually provided to insure a constant flow of treated solution. While one unit is processing the solution, the other is regenerated.

from viscose rayon spin bath; recovery of sodium from sulfate liquor in wood pulping.

Purification of organic materials is the last major use. One job is removal, by a hydrogen-form cation resin, of amine and ammonia during synthesis of methanol from carbon dioxide and hydrogen.

• **Continuous Exchange**—This method implies continuous, countercurrent flow of the resin and solution through a contacting device. Advantages include continuous high throughputs, effective utilization of chemicals, less resin and water needed, compact equipment.

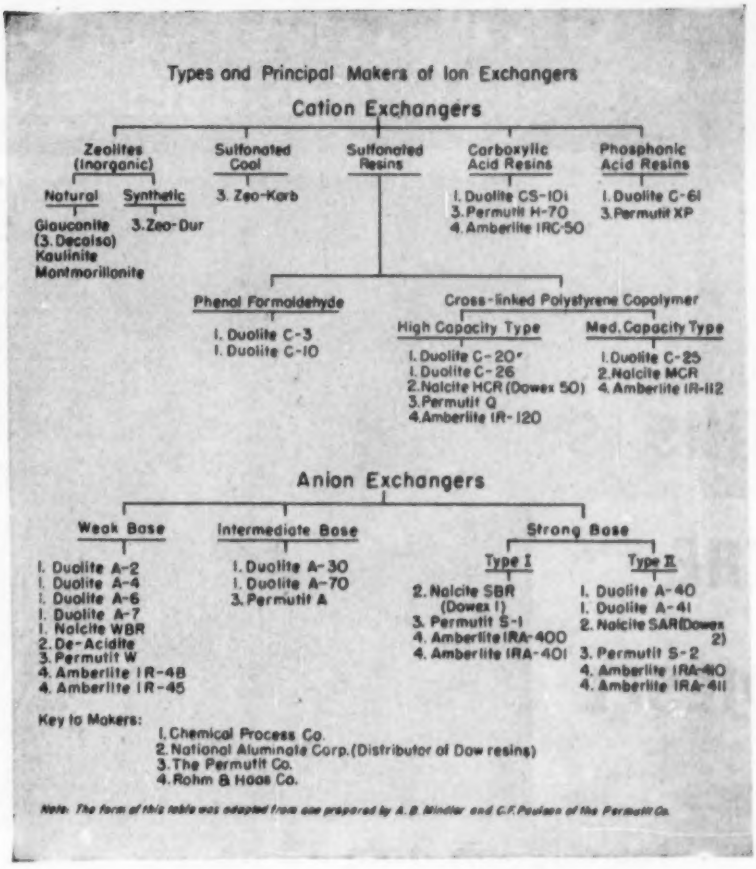
So far, only one commercial unit, Dorr's Hydro-Softener, is truly continuous and countercurrent (McG-H Digest, July, p35). Processing is accomplished by fluidized contact between water and two resin beds. Exhausted resin is transferred to a regeneration cell and washed free of salt before it is recycled to the softening cell.

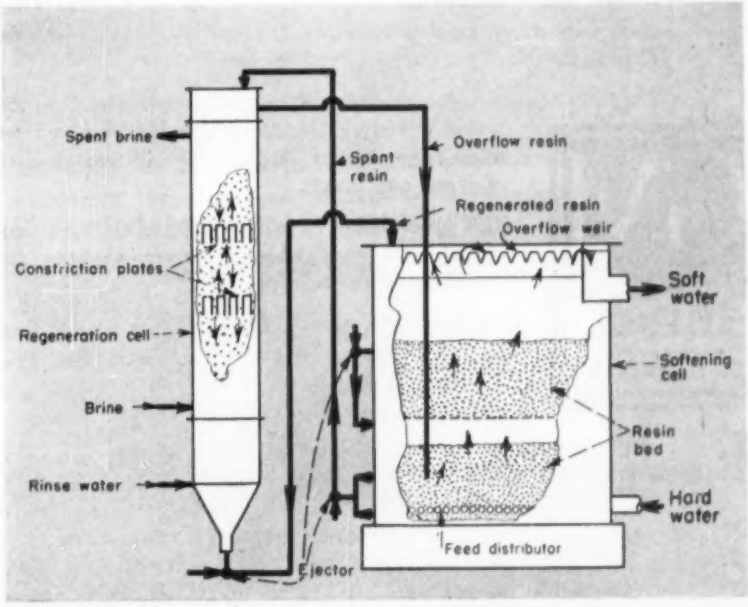
Continuous exchange has not yet been commercialized more extensively because of trouble in obtaining satisfactory contact between liquids and solids. As equipment improves, the process will invade water demineralization, metal recovery, de-ashing of glycerine, and other organics.

• **Electromembrane Exchange**—Research has been done on this process in both Europe and the U. S. Its industrial significance has been recognized, but economically suitable membranes have not been available.

Ionics Inc. has developed an experimental model to demineralize brackish water (McG-H Digest, June '52, p48). Rohm & Haas has worked with a filter press model, and the Council for Applied Scientific Research in Holland has built an apparatus similar to a filter press.

Suggested uses for electromembranes, when they have proved successful, include desalting of aqueous organic solutions, recovery of acid and iron from spent pickle liquor, production of salt-free caustic and chlorine.—Chem Eng, Oct, p161





HYDRO-SOFTENER for water is a continuous, countercurrent ion-exchange unit with two fluidized beds of resin. A 6-ft.-dia. softening cell can reduce hardness from 160 to 4 parts per million of Ca CO_3 at a 50% salt efficiency. Flow rate is 170 gal. per min. Ejectors transfer exhausted resin from the softening cell to a 22-in. dia. regeneration cell.

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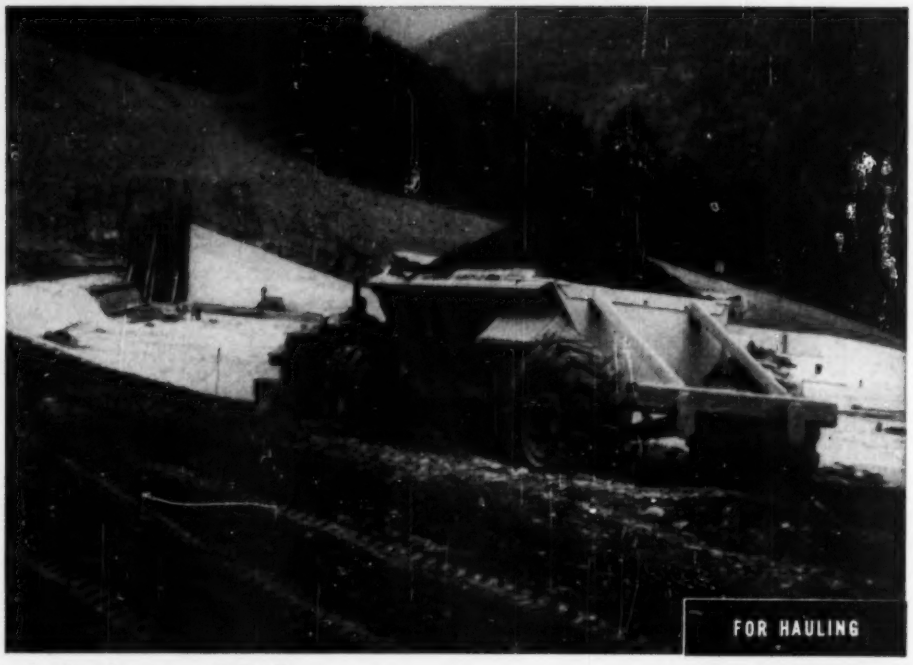

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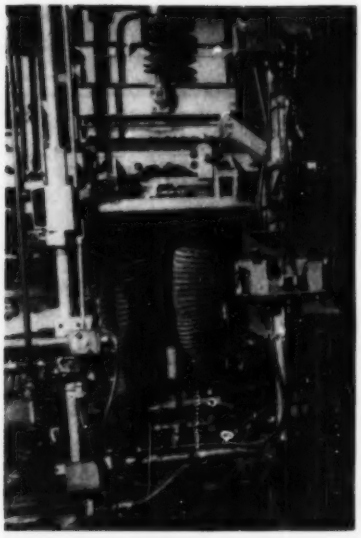


MOLD-MAKING machine above packs sand between pattern and flask.

CONVEYORS move drag and cope to machine that closes mold.

TWO-LADLE MACHINE, controlled from booth, pours molten metal.

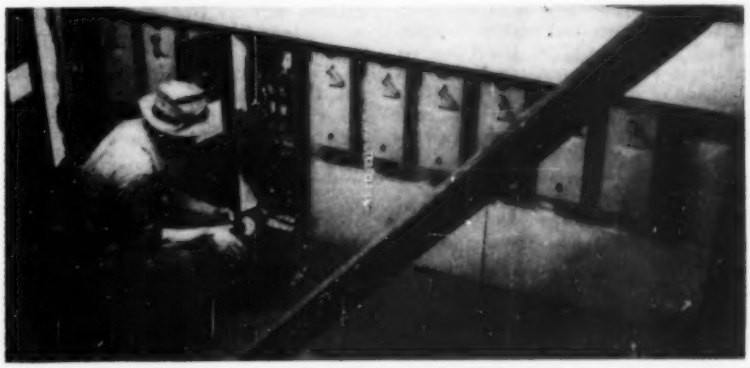
Automatic Iron Foundry

THE PICTURES on this page illustrate a big new step in automation —a "push-button" foundry. Built by the Osborn Manufacturing Co. of Cleveland, Ohio, for Eastern Malleable Iron Co.'s Eberhard manufacturing division, it makes 2½-lb. castings automatically at a rate of one per second. The main steps:

Mold-making. An automatic machine handles both the drag (bottom) and cope (top) of metal flasks containing twelve molding compartments. Pattern for the product swings alternately into position under the inverted drag and cope as special sand flows into the flask. After sand is rammed by jolting and pressure, the machine sends the flask to another station where the pattern is withdrawn, and drags and copes are automatically placed on parallel conveyors (if cores are needed, they are inserted manually here).

Closing. An automatic machine places cope upon drag, forming complete mold, and inserts sprue.

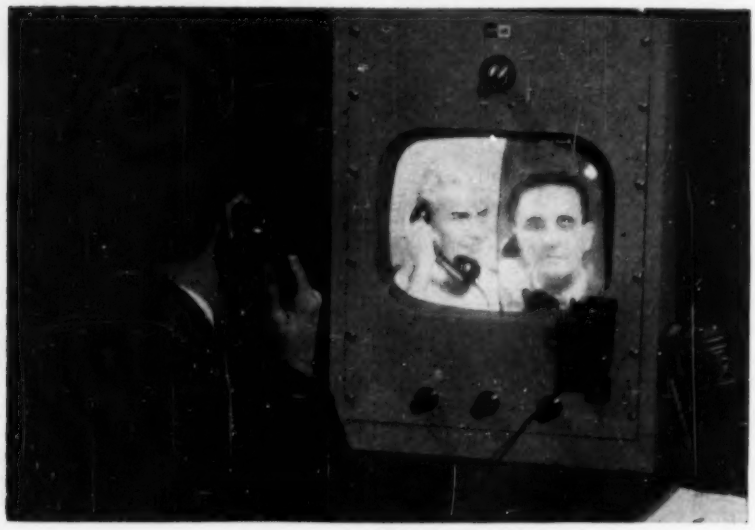
Pouring. Two molds on each of two production lines are pushed into a two-ladle pouring station. Pouring is done in 16 sec. Molds are then cooled and castings removed.—Business Wk, Oct 9, p130



FOUNDRY "BRAIN" (above) controls two molding units, each handling 50 flasks (600 castings) every 20 min. Hourly output is 3,600 castings.

CASTINGS weighing about 2½-lb. each are conveyed to these trays preparatory to finishing operations. Next automatic foundry will cast Pontiac motor blocks.

TECHNICAL IDEAS



Intercom Television Makes Its U.S.Debut

This new Kay Lab unit makes television-telephone intercommunication systems a commercial reality. It is designed around a 17-in. television receiver, a vidicon television camera, a telephone handset, and necessary switching equipment. When telephone is lifted from its hook, the caller's image appears on one-half of both caller's and responder's screens. The responder's image appears on the remaining half of each screen. Either user can make the entire screen available for viewing blueprints, documents, other objects. Unit can be used as standard set.—Electronics, Oct, p8

Nylon for Outdoors—Despite useful properties, nylon has been unsuited for outdoor use because of its instability to light. Now Du Pont has introduced a nylon resin that is resistant to ultra-violet degradation. Called Zytel 105 Bk-10, it is readily moldable with good gloss and is free from smears and dull spots.—Mod Plastics, Sept, p250

Versatile Plane Radar—New lightweight airborne radar produced by Sperry Gyroscope Co. for the U. S. Air Force incorporates search, surveillance, beacon interrogation and reception, and cloud- and collision-warning features. Weight is only 150 lb. Ranges: for closeups, 3 to 30 miles; fixed, 50, 100 and 240 miles.—Aviation Wk, Sept 6, p17

Another Radioactivity Use—Colgate-Palmolive-Peet, manufacturer of Colgate toothpaste with an anti-enzyme agent, measures agent's effectiveness by a new technique. A Geiger counter showed that a radioactive form of the anti-enzyme remained on teeth (and protected them against decay) for 48 hr.—Chem Wk, Oct 2, p78

German Machine Tools—Leipzig Fair in September showed that Communist countries are making rapid strides in machine-tool building. Pride of the show was an East German 14-station transfer line machining half of a motorcycle-engine housing.—Mach, Oct 1, p1765

Removes Weld Metal—Some 300 in. of stainless-steel weld metal 2 in. wide and 2¼ to 5¼ in. deep had to be removed from a shovel dipper without disturbing surrounding metal. Eutectic Welding Alloys Corp.'s ChamferTrode, a special electrode for gouging metal, did the job. Total time was 18 hr.—Const Meth & Equip, Oct, p10

Upside-down Dam—To insure flow of cold river-bottom water into the cooling system of its new steam-electric generating plant at Kingston, Tennessee, the Tennessee Valley Authority is building an "upside-down dam" in the Emory River. Reaching from surface down to within 15 ft. of the river bed, it will block off warm upper waters while permitting cold bottom waters to pass.—Business Wk, Aug 28, p52

Cheaper Meat Retorting—A major problem in retorting, or cooking, of canned meats is heat loss from retort and steam lines. Experiments by the American Meat Institute Foundation show that reflective aluminum foil and dead air are the best counter-measures. Retorts using this insulation save 50% of cooking steam.—Food Eng, Sept, p5

Gas Turbines—An automobile company will soon announce that it has developed a gas turbine that can be built of conventional and abundant metals such as steel. Several test automobiles will be powered by turbine prototypes.—Am Mach, Oct 11, p117

Epoxidize Fats and Oils—Du Pont has developed a new method to epoxidize unsaturated fats and oils into chemical intermediates. Process utilizes acidic ion-exchange resin with hydrogen peroxide. Outlook: resin plasticizers and stabilizers, plus intermediates for insecticides, paints, lubricants.—Chem Eng, Oct, p105

Gas-insulated Transformers—First application of high-dielectric gaseous insulation to high-voltage power transformers is announced by General Electric Co. Gas used is sulfur hexafluoride. Two units, rated at 2,000 kva., 69 kv., are now under development. New process is expected to make transformers lighter, quieter, and safer, and may lead to elimination of liquids as insulations.—Elec World, Sept 6, p144

Radio Controls Traffic Lights—Chicago is studying radio as a means of controlling heavy traffic in congested areas. Initial setup will include radio control and operation of 11 signalized intersections. Signals from central station will control cycle duration at each intersection for maximum efficiency of traffic flow. System can be manually operated.—Eng News-Rec, Aug 26, p43

Automatic Assembler—Experimental conveyor-type machine, made by United Shoe Machinery Corp., automatically inserts resistors, capacitors, jumper wires, and eyelet-type terminals in electronic printed circuit wiring boards at a rate of 1,200 per hr.—Electronics, Sept, p6 & p232

Textile Briefs—Nonwoven synthetic chamois cloth has been put on the market by Lowndes Products, Inc., Greenville, S. C. Cloth is made of cotton bonded with Chemigum Latex developed by Goodyear Tire & Rubber Co. . . . Double-knotted cotton-glove fabric with a tight knit, lightweight, and soft texture has been developed by Fownes Bros. & Co., Inc.—Textile World, Oct, p217

Steel Tests—U. S. Steel Corp. recently tested a new steel, Carilloy T-1, at —45°F. Burst tests and drop impact tests were made on two large, closed pressure tanks. Results: One non-stress-relieved tank burst at internal pressure of 2,850 lb. per sq. in.; the other gave way when a 13-ton weight was dropped vertically on it from 101 ft.—Weld Eng, Oct, p5

Repairs Drum Leaks—Leaky drying drums can be repaired by Metalseal (American Metalseal Corp., West New York, N. J.) impregnation. Drum is left in place. Drum is evacuated and impregnant drawn in through hose connections. Steam is introduced to heat and pressurize the impregnant, causing it to seal leaks.—Factory, Oct, p154

Copter Moves Its Own Magnesium Hangar

Sikorsky HRS helicopter is shown here lifting frame for a 2,000-sq. ft. hangar in a Marine Corps demonstration. Made of bolted magnesium extrusions, frame weighs 1,200 lb. It will be covered by vinyl-coated glass cloth weighing 350 lb. New hangar is said to be lighter and cheaper than tents. It can be air-lifted at speeds up to 60 miles per hr.—Aviation Wk, Aug 30, p22

Engine Accessibility

Complete cab of the Diamond T Motor Car Co.'s newest diesel tractor tilts forward manually, as above, in a matter of seconds, to expose the entire front-end area for inspection and service. Power for tilting is provided by a pair of counter-balancing springs, operating like those of a tilting garage door. The new tractor, Model 723C, was developed for the largest class of haulers—those handling payloads in the 18- to 20-ton range with tandem semi-trailers.—Fleet Owner, Oct, p64

Giant Hydraulic Gates—Two of the world's largest hydraulic control gates, each 58 ft. high by 45 ft. wide and weighing 225 tons, have been installed by Dominion Bridge Co. at plant of Hydro-Electric Power Commission of Ontario, Canada. They will control water drawn from the Niagara River through two 5-mile-long, 45-ft.-wide concrete tunnels. Design was for maximum reliability since gates may not be used over extended periods of time.—Power, Oct, p114

Grease Master—Automobile lubrication invoices with detachable self-addressing mailing cards feature Skelly Oil Co.'s new Grease Master plan. Filling out of invoice makes carbon imprint of customer's name and address and date of service on detachable cards. Dealer files these according to day of month and mails them as "follow-ups" on same day of following month. Plan has substantially increased sales by reminding customer his car is due for a lubrication.—Nat Pet News, July 21, p38

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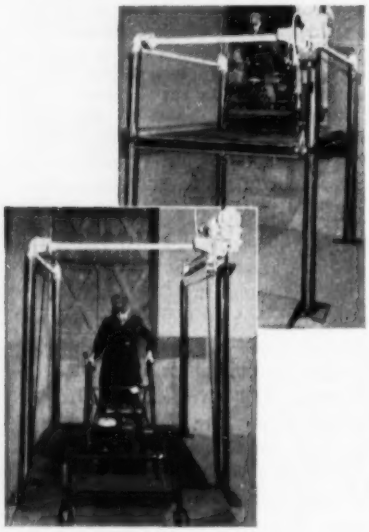

Photos show typical GLOBE Electro-LOADER used in busy factory. One man can move heavy loads between plant levels quickly and *economically*. Power shuts off automatically when platform reaches maximum "up" and "down" positions. Use the coupon to get illustrated data booklet on GLOBE Electro-LOADERS.

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- **Portable tube-wall thickness gage measures extent of corrosion inside pipes in an oil refinery**
- **Effect of SO_3 on sulfate formation on boiler tubes was found to be independent of temperature**
- **Zone melting of aluminum can be studied by using Zn^{65} tracer. These are a few applications of . . .**

Radioisotope Techniques

ALMOST 800 DELEGATES to the second Radioisotope Conference in England this year absorbed a wealth of information on new applications of radioisotopes to industrial research and control, chemistry, metallurgy, plant nutrition, and other subjects. Here are highlights from the sessions of interest to managements that may be thinking of applications in their own plants:

• **INDUSTRIAL**—A. H. Knight (Macaulay Institute for Soil Research, Aberdeen, Scotland) described a probe-type instrument capable of being lowered into a 1-in.-dia. bore hole to measure soil moisture. It measures the number of slow neutrons produced by collision of the fast neutrons from a radium-beryllium source with hydrogen nuclei in the soil. Indium and silver foils were used to measure the neutron flux.

A gage was described by E. N. Shaw (Aldermaston, England) for measuring thin tissues such as cigarette papers. Alpha particles from radium were used as the source, a windowless ionization chamber as detector. With a prototype instrument installed in a factory, stabilities of the order of ±0.5% were obtained over several hours; short-term variations of as much as 3% of the paper weight were experienced, probably because of temperature changes in the air gap.

A portable tube-wall thickness gage, described by J. L. Putnam (Harwell, England), was primarily designed for measuring the extent to which corrosion has occurred inside pipes in an oil refinery. A cobalt-60 gamma-ray source is used with a scintillation counter. A gating circuit insures that only the radiation that has undergone an energy change by scattering from the pipe is detected and not the direct Co^{60} radiations. Heavy lead shielding is thus avoided.

To study a textile problem, D. S. Taylor (Wool Industries Research Association, Leeds, England) used phosphorus-32 to label individual fibers. In drafting, it has been suspected that irregular movements of fibers have resulted in an unevenly finished textile product. The time for individual fibers to move between two counters was measured, and hence the fiber path can be deduced.

Autoradiographs proved that the labelled fibers formed a natural part of the sliver. It was found that, contrary to the usual assumptions, the chance of a fiber being accelerated depended on the probability of its coming into contact with fibers gripped by the front rollers in the drafting process, and that the fiber when accelereated moves with a velocity intermediate between those of the back and front rollers,

The possible value of cerium-144 as a gamma-ray source for industrial radiography was discussed by H. S. Peiser (Sheffield, England). The use of a heterogenous source of gamma rays for radiography is advantageous for the inspection of specimens of widely different thicknesses—often met with industrially. The half-value layer for steel as determined by these studies was 1.5 ± 0.2 in. This figure, however, increased with increasing steel thickness.

• **CHEMISTRY**—E. J. Gibson (Fuel Research Station, Greenwich, England) described two uses of radioisotopes in chemical problems of fuel research. Using sulfur-35 it was shown that the contribution of sulfur trioxide to sulfate formation on boiler tubes

Bank demolished—
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Mr. Charles W. Swartz, right, Ashland Manager, is with Mr. O. Vandermale, Burroughs man who helped the bank resume service.

Call your Burroughs man

was almost independent of temperature, but that the formation from sulfur dioxide increased rapidly above 600° C. and was catalyzed by ferric oxide.

The second study had been made to ascertain the role of oxygenated radicals in the Fischer-Tropsch process.

To study catalyst poisoning, C. Bokhoven (Staatsmijnen in Limburg, Gelleen, Netherlands) described experiments in which $C^{14}O$ and $C^{14}O_2$ were passed over catalysts used in the synthesis of ammonia. The activity of the catalyst and that of the outgoing gas were measured continuously. It was found that the poisoning in both cases confirmed the fact that if carbon monoxide or carbon dioxide is hydrogenated to methane, the water vapor formed poisons the catalyst.

• **METALLURGY** — P. Albert (Centre d'Etudes de Chimie Metallurgique, Vitry-Seine, France) described a study of the purification of aluminum by zone melting, using zinc-65 as a tracer, and measuring copper, sodium, and silicon by neutron-activation analysis. The best displacement velocity to obtain maximum purification was found. Purification resulting from repeated application of zone melting to the same ingot appeared to be in the ratio of a geometrical progression to the number of passages of the molten zone.

Self-diffusion in alpha brass containing 1% and 27% of zinc and in ordered beta brass was measured by W. L. Mercer (University of Leeds, England).

• **PLANT NUTRITION**—Foliar fertilization (through the leaves) with phosphatic nutrient labeled with phosphorus-32 was discussed by K. Kaindl (Osterreichischen Stickstoffwerke, Linz, Austria). He showed that the uptake of potassium acid phosphate through the surface of the leaves depends on temperature, humidity, and soil, and on the developmental stage of the plant, the latter being most important. Two periods in which the uptake is significantly high are the earliest developmental stage and just before the maximum vitality, which in the case of cereals is about 1 month after sowing.—Nucleonics, Oct, p48

Special Plant Conditions Demand 100 Ft. Candles

In Rohr Aircraft Corp.'s new Riverside, Calif., plant, light intensity at work level ranges from 75 to 100 foot-candles—with 130 at a few key spots. Plant officials believe the superior lighting pays off for these reasons:

• **Most of the plant's work** is fabrication of sheet aluminum and stainless steel. Workers need bright lighting to see scribed lines on shiny metal surfaces.

• **Constantly changing** contracts mean constant shifts in production layout. So light level must be high throughout the plant.

Rohr's lighting is 80% mercury, 20% fluorescent. This ratio gives brightest light with no objectionable color. Fluorescents were chosen because they are more efficient than incandescents.—Factory, Oct, p130

Oil Tank Trucks Now Bottom-Loaded

Bottom-loading for oil tank trucks has been put on a commercial basis by Tokheim Corp., Indiana.

Key to the new method is a hydraulically-operated fill valve, installed at ground level, that produces two flow rates—600 gal. per min. maximum and 35 to 40 gal. per min. reduced flow for "topping off."

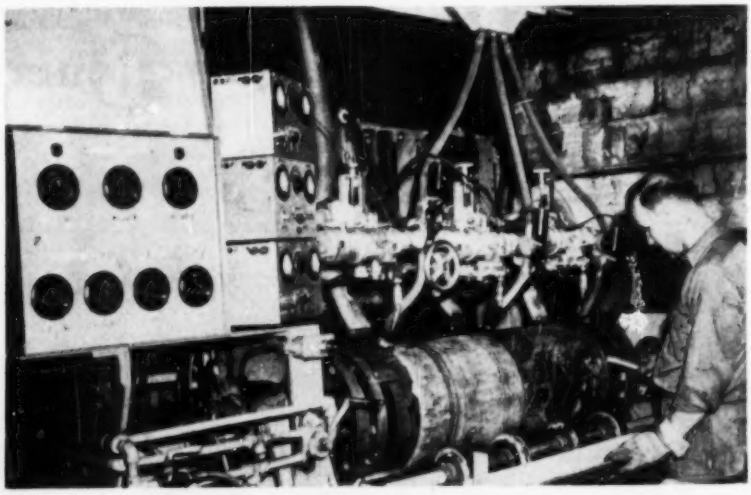
Loading operation is as follows: Pilot valves control the fill valve unit and are connected by hydraulic lines to two rigid control tubes of different heights installed within each tank compartment.

During loading, product rising into the compartment overflows into the shorter tube, stopping the high-capacity flow. When it overflows into the taller tube, flow is cut off completely.—Nat Pet News, Sept 29, p16

Rented Air Conditioning

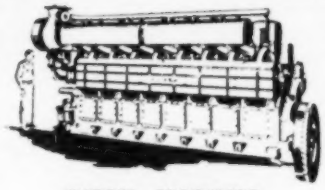
Latest addition to industrial machinery offered on rental basis is industrial air conditioning. Plan offered by Broadway Maintenance Corp., Long Island City, New York, covers installation and maintenance over a 5-year period, with optional rental or purchase thereafter.

For example, a $100,000 system costing a firm $166,000 of earnings, less taxes, could be installed and maintained for 5 years at $40,000 yearly.—Power, Oct, p135



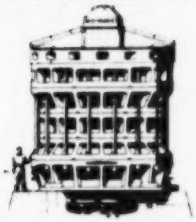
Three-Headed Welder Joins Cylinder Sections

Prest-O-Lite factory of Union Carbide & Carbon Corp. welds propane cylinders by unusual three-headed submerged-arc welder. It joins four sections by three simultaneous welds. Head 1 welds a protecting ring to top of the cylinder. Head 2, with a twin-rod feed, joins top and bottom shells to form the cylinder. Head 3 makes a continuous weld between foot ring and bottom of cylinder. Four cylinder sections are locked into lathe-like fixture for welding. Welds are smooth and need no finishing.—Weld Eng, Oct, p50



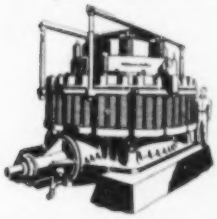
DIESEL ENGINES

2 and 4-cycle types, for fuel oil, Duafuel and natural gas operation —from 10 to over 10,000 H.P.



SYMONS PRIMARY CRUSHERS

for heavy duty crushing of ores and industrial minerals.



SYMONS CONE CRUSHERS

for all fine reduction crushing requirements.

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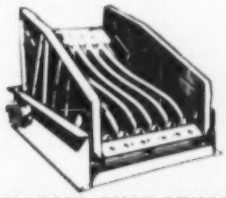
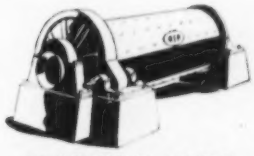
FOR QUALITY AND PERFORMANCE



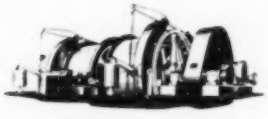
SYMONS VIBRATING GRIZZLIES AND SCREENS

for all types of wet and dry screening, from scalping on through the finer separations.



GRINDING MILLS

and other Machinery for basic processing of ores and minerals.

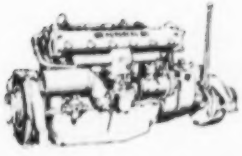


MINE HOISTS

in types for hauling both ore and men, in large coal and metal mining operations.

RAILWAY MAINTENANCE MACHINERY

a full line of efficient, money-saving machinery for top quality track maintenance.



GASOLINE MARINE ENGINES

from 95 to 150 H.P. for fish boats, tugs, and pleasure craft.

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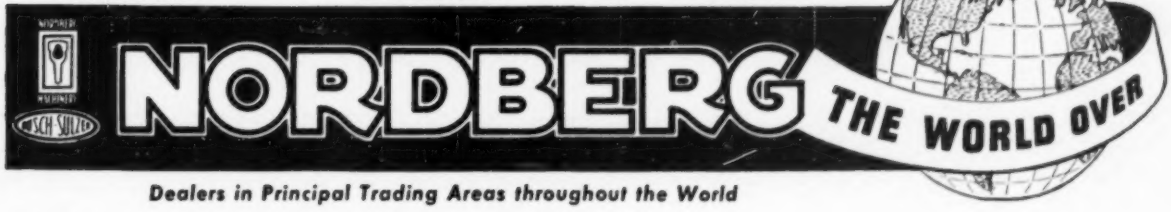
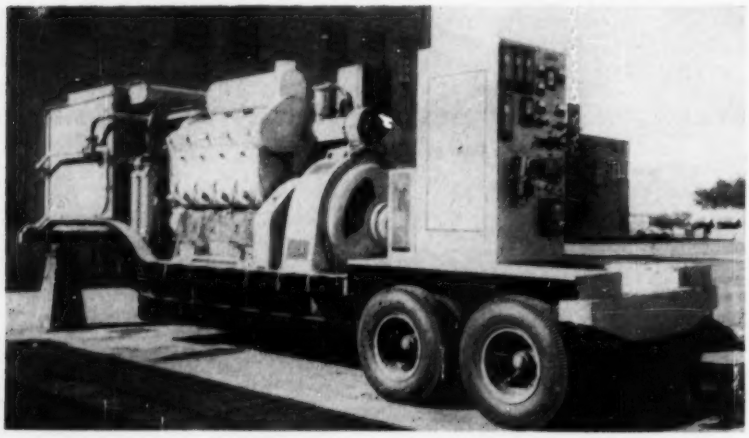


Dealers in Principal Trading Areas throughout the World

NEW PRODUCTS



Mobile Power Plant Enables Utilities to Supply Emergency Service Quickly

This unit is one of a line of five new mobile electric power generating plants developed by General Motors' Electro-Motive Division. Designed for use by utility companies, they are the first big, completely integrated, standardized mobile plants ever offered to power concerns.

The new units are GM's answer to the problem: how to supply emergency power to areas that need it in a hurry. Any of the plants can reach an emergency area within hours. Two travel by truck, the other three by rail.

Initial cost per kilowatt of capacity is in proportion to that of a big central steam generating plant. A 1,000-kw. unit—biggest of the five—costs about $90,000, or $90 per kw. (to build a central steam plant costs anywhere from $150 to $200 per kw.).

Operating costs will naturally be higher than those of a central plant. But one factor tending to hold down costs is the self-operating nature of the units. By means of impulses sent by wire or radio, each can be stopped or started by a central operator who might be hundreds of miles away.

Once started, the unit's diesel engine accelerates to full speed within 5 sec. Within another 20 sec., its generator is loaded to full capacity, and the unit is putting out power.—**General Motors Overseas Operations, 1775 Broadway, New York 19, N. Y.**

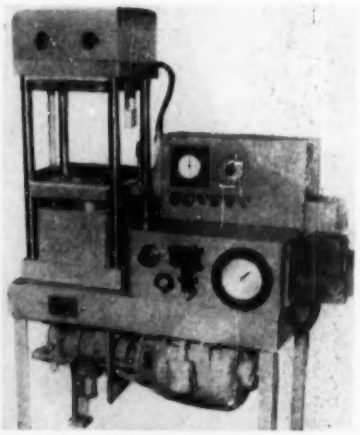
Mechanizes Posting

New Robot-Kardex gives all the advantages of Kardex Graph-A-Matic controls in a mechanized unit for greater output. Visible indexing and visible signalling are available with push-button positioning.

Any one of 60 slides are available in an average time of 4 sec. The average posting clerk can save 30% of her time. Slides are delivered automatically to a firm, level working position at desk height with ample knee space. The unit occupies 41% of the floor space of standard Kardex cabinets —4,020 visible indexed sets of 8x5-in. records take up 13.4 sq. ft. of floor space.—**Remington Rand Inc., International Div., 315 Fourth Ave., New York 10, N. Y.**

Microwave Telephone

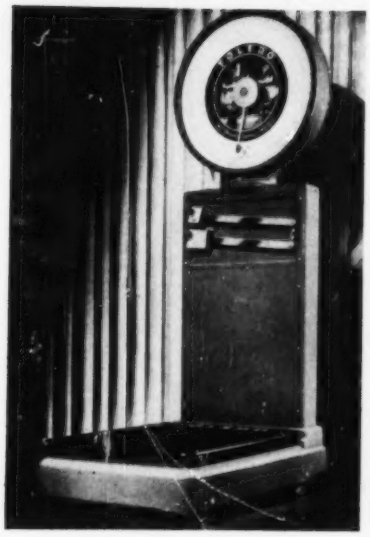
Low-priced "Telelink" microwave relay system provides telephone service to isolated areas where number of prospective customers does not justify extensive wire-stringing. Connected to 110-v. household current, Telelink equipment may be mounted atop a pole or rooftop for operation across distances up to 50 miles. System provides full selective ringing. Ten parties on each of two channels, 20 parties in all, may have their own number.—**Raytheon Mfg. Co., International Div., Waltham 54, Mass.**



Plastics-Testing Machine

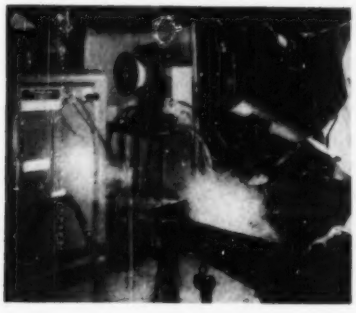
Hydraulic plastics-testing machine is designed to test the flow characteristics of thermosetting plastics material by using the American Society for Testing Materials standard cup-mold method. When equipped with proper dies, it will also accommodate thermoplastics material.

The machine is a complete self-contained unit including standard heating plates, motor-driven pump, motor, starter, and complete control panel.—**Watson-Stillman Co., 150 Aldene Rd., Roselle, N. J.**



Industrial Scale Line

New industrial scale line includes a full range of models from bench scales to heavy-duty truck scales. The model shown is the portable platform model, in which platform size has been increased 18% but over-all base dimensions have been reduced by putting wheels within the base outline. All scales feature a full-floating, double-pendulum mechanism, which is claimed to increase precision and strength and eliminate hand adjustments. Dial can face in any of eight directions. —**Toledo Scale Co., Toledo 1, Ohio.**



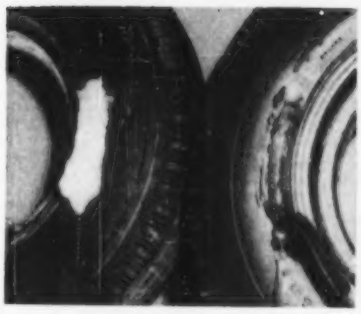
Welding Process Gives Higher Speed, Lower Cost

Consumable-electrode, inert-gas arc welding process is claimed to give 15 to 20% higher welding speeds at 25 to 50% lower cost than other manual or semiautomatic inert-gas methods. Key to process is the coated electrode, designated as West-ing-arc MS-20. It is used with a selenium-rectifier welder of 82% efficiency and 95% power factor at continuous rated load. The electrode now makes the process economical for mild steel.

Welds can be painted without cleaning because of virtually no spatter or any slag on the weld metal. The process can make fillet, lap or butt welds in mild steel, with or without normal mill scale, in thicknesses from 1/16-in.— **Westinghouse Electric International Corp., 40 Wall St., New York 5, N. Y.**

Rubber-Lined Cyclones

Standard 6-, 12- and 24-in. Dorr-Clones (cyclones for wet classification) have been redesigned. They now have replaceable molded rubber inserts, which increase operating life of cyclone sections. Greatest modification was made in the 6-in. cyclone; the previous rubber-lined casting has been replaced by a two-piece cylindrical casting into which five rubber molded sections fit. Rubber inserts for all three sizes can be quickly replaced, thereby reducing maintenance costs.—**Dorr Co., Stamford, Conn.**



Airtight Tubeless Tire

Designed to hold air instead of a tube, tubeless tire with new-type cord shows airtightness by comparison with tubeless tire with old-type cord. Strips were cut from sidewalls of both tires and soap solution was applied. Air seeping through tire with old-type cord foamed out in bubbles, as shown on the tire at the left.

The new cord is chemically treated rayon or nylon, which then is subjected to precise time, tension and temperature control. The tire is claimed to reduce blowout danger and road delays from punctures and to provide greater skid resistance.—**Goodyear Tire & Rubber Export Co., Akron 16, Ohio.**

Harvester-Thresher Design Saves Grain

Self-propelled combine, in 10-, 12- and 14-ft. sizes, has been designed to save more than ever of that last, hardest-to-get 10% of the crop often lost in the field. Grain-saving features include opposed-action, double-shaking cleaning and three-point separation (at concave, finger grate, straw rack). Combine, powered by 60-hp., six-cylinder engine, has range of 28 speeds from 1 to 15 mph. It is available in either grain or rice model.—International Harvester Export Co., 180 N. Michigan Ave., Chicago 1, Ill.

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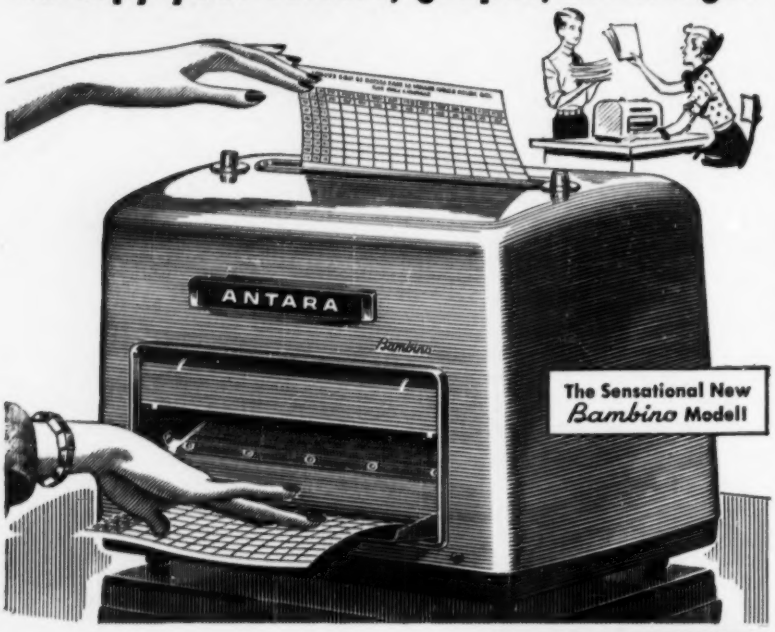
ANTARA

to copy your letters, graphs, drawings!



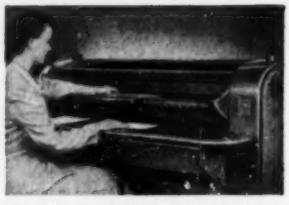
Instant copies! Errorless copies! Now you can produce them easily on the small, compact copying machine made by ANTARA to fit into any department, taking only the space of a typewriter . . . and taking the place of re-typing and checking! The new machine will reproduce anything that is typed, ruled, written or drawn on translucent paper.

In seconds, this new ANTARA produces copies that are amazingly clear and legible . . . 200 copies per hour! (Cost per copy is a fraction of the price you pay for your daily newspaper!)

With the new ANTARA you can reproduce:

Letters	Charts	Sketches
Graphs	Manuals	Records
Orders	Memos	Reports
Forms		Budgets

Engineering Drawings



Also for industrial use: the large desk-top model, the ANTARA **O-M** . . . copies up to 16" wide (40 cm.) . . . or the upright model, the ANTARA **Streamliner** . . . copies up to 42" wide (106 cm.).

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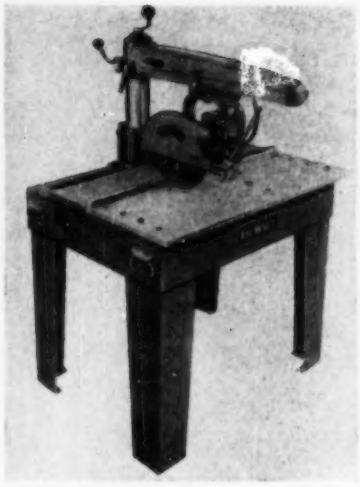


Radial-Arm Wood Saw

Model GWI is a new radial-arm woodworking machine that offers advantages not previously available in this type of machine. The motor develops 1½ hp. and has a voltage-change switch for operation on either 115 or 230 volts.

Machine capacity with a 10-in. blade is 16 in. on 1-in. material. Maximum depth of cut is 3 in. with the 10-in. blade and 4 in. with a 12-in. blade.

Other new features: safety lock switch, multi-color Plextone finish, longer radial arm and wider worktable than on previous models.—**American Machine & Foundry Co., 261 Madison Ave., New York 16, N. Y.**

Single-Pass Lapping

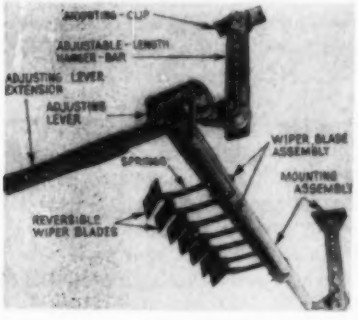
Single-face, flat lapping machine, the 36-F Hyprolap, is a high-production machine that completely laps the work in a single pass. This is made possible by superiority of bonded abrasive laps over cast-iron laps. Another advantage of bonded abrasive laps is cleaner work surfaces, free of imbedded or trapped grit.

The machine is semiautomatic in operation. Lapping is interrupted only to true the lap. In normal operation, the operator loads with right hand, removes lapped pieces with his left. A pressure mechanism automatically applies the proper weight to the parts grouped in each workholder to secure the desired lapping action.—**Norton Behr-Manning Overseas, Inc., Worcester 6, Mass.**

Device Stabilizes Load

Hydraulic load stabilizer for fork trucks provides proper pressure for vertical clamping of loads and lessens the effect of side slippage and vibration. It thus allows faster, safer moving and stacking of palletized loads.

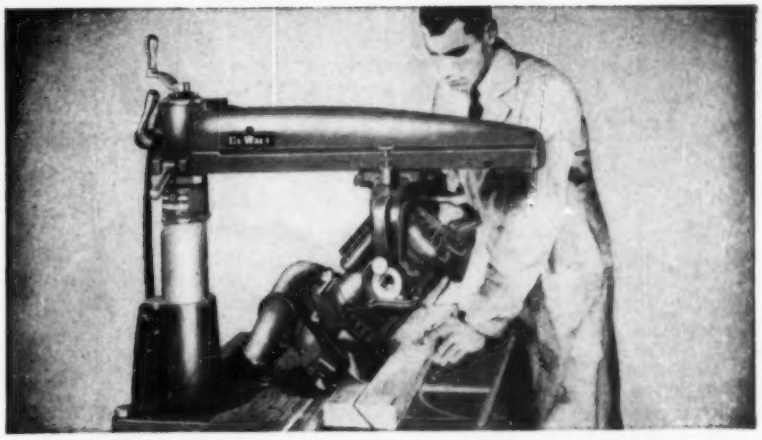
The stabilizer is controlled by a hydraulic cylinder for clamping and unclamping. It is padded with rubber to protect load surfaces. Adjustments are easily made for different load sizes.—**Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia 15, Pa.**



Conveyor Belt Cleaner

S-A spring-type conveyor belt cleaner removes material adhering to a belt after discharge, thus insuring maximum belt life by preventing cover wear. Steel wiper blades perpendicular to the belt surface, but diagonal to its line of travel, scrape off material into the discharge chute.

Wiper blades are mounted on spring arms, permitting adjustment of pressure against the belt. The arms are designed with a new twist to prevent build-up of dribble during operation.—**Stephens-Adamson Mfg. Co., Aurora, Ill.**



All-purpose DEWALT® *Saws*

...every time you change the cutting tool you have another machine!

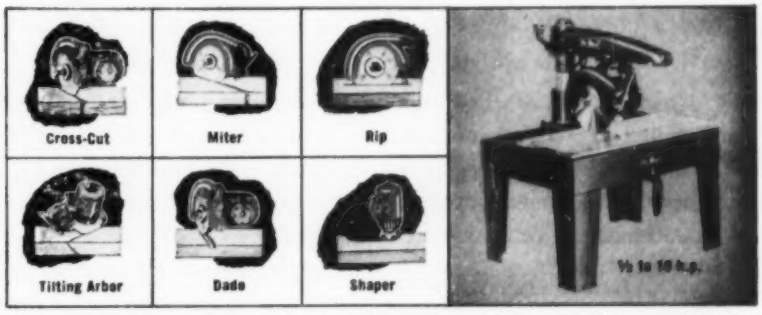
DeWalt is the world's most popular power saw, with over 100,000 now in use.

Because of their *unlimited flexibility*, DeWalts are being used for all types of construction, for public works projects—and for literally hundreds of uses in the woodworking, metalworking and plastics industries.

They are essential to any industrial plant for plant maintenance, pattern making, and boxing and crating.

The all-purpose DeWalt is many machines in one for the price of one. Changeovers from one job to another are easily and quickly made simply by changing the cutting tool.

In every part of the world, DeWalt users are cutting costs—with speed, accuracy and safety.



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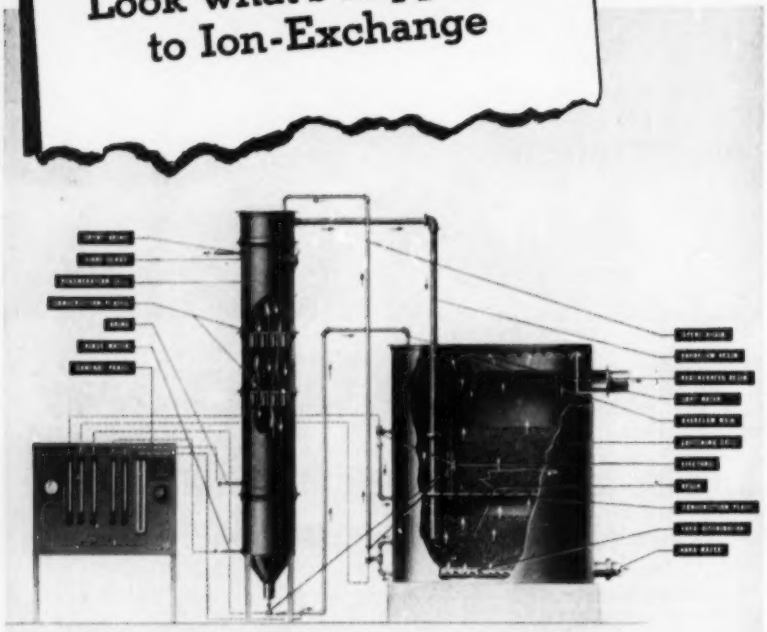
Look what's happened to Ion-Exchange



Illustrative drawing of the Dorrco Hydro-Softener. Note that regeneration is carried out in a separate tank from the softening cell to minimize danger of contaminating treated water.

It's Gone Continuous!

Infant prodigy of the Process Industries, ion-exchange has often been a problem child as well. Batch operation has been one of its major limitations in today's age of continuous processing.

Now, for the first time, the base or cation exchange cycle has been put on a completely continuous basis through the Dorrco Hydro-Softener. Originally developed for softening municipal and industrial water supplies, the Hydro-Softener has definite operational and economic advantages over conventional batch systems. And the basic principles show promise in many other fields as well.

Whenever a process involves the use of ion-exchange, the separation of finely divided solids in suspension, or fluidizing techniques, Dorr and its Associated Companies throughout the world can provide the correct equipment for the job.

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NEW PRODUCT BRIEFS

Float-type Moisture Trap—New low-cost float-type moisture trap drains moisture and condensate continuously and automatically from piping systems, purifiers, and other equipment handling air, gas, or steam. They are suitable for pressures up to 200 lb. per sq. in. gage and have the unique feature of an optional inlet for ease of installation.—**V. D. Anderson Co., 1935 West 96th St., Cleveland 2, Ohio.**

Chemical-cartridge Respirator—New respirator holds two cartridges. One is for protection against organic vapors and acid gases, or ammonia. The other may be the same or have a fill to protect against dust, fumes, mist, and smoke. Vision is excellent.—**Mine Safety Appliances Co., Pittsburgh 8, Pa.**

Resists Wrinkles—New finish for cotton, known as Cyana Superset, increases wrinkle resistance, reduces bleeding of direct dyes, improves wash-fastness of many types of dyes. Fabrics show little or no loss in strength and yellowing because of chlorine pickup from household bleaches.—**American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.**

Traction Motor—Model G-E 761 motor is designed to meet needs of 90% of all foreign locomotives in general freight and passenger service on track gages down to 1 m. It weighs 4,250 lb., and has shown excellent commutation on the test stand. — **International General Electric Co., 570 Lexington Ave., New York 22, N. Y.**

Belt-conveyor Idler — Cable-suspension idler for belt conveyors provides a load-conforming catenary, cushions the belt, and handles both bulk and packaged materials. Called Limberoller, it has two bearings and carries the belt on neoprene disks, all of the same size and all revolving at the same speed. Disks are molded to flexible steel cable, freely suspended from the two bearings, and exert slight gripping action to reduce belt slippage.—**Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.**

MANAGEMENT REPORT

So many business organizations are growing so complex that their managements must make policy decisions on the basis of technical reports submitted to them. Such reports, therefore, must be reliable, accurate, complete. The man preparing a report should first analyze the problem, outline a workable plan, then evaluate results.

In writing the report, he should: (1) make it easy to read; (2) use standard terminologies; (3) present good photographs and illustrations; (4) include story essentials in nonrepetitious manner in the introduction and results; (5) arrange data to be of most convenience to reader; (6) acknowledge contributions of others.—Prod Eng, Oct, p154

What do consumers want? Many firms spend fortunes sounding out the public. E. I. du Pont de Nemours simply polled its own employees—2,000 workers and their families in four different plants and states. The results:

Du Pont people like:

- Ranch-type houses—68% voted for them.
- Solid colors—plain sport shirts got 52% vote.
- Two-trouser suits—men voted 3 to 1 in favor.
- Painted walls—top choice (44%).
- Separate dining rooms—59% said, "Yes."
- Two-toned automobiles—an overwhelming choice.

They don't like:

- Two-story houses—only 4% liked them best of all.
- Men's garters—only 3% want them.
- Short hemlines—women gave them scant 2% approval.

They were evenly divided on:

- Wall-to-wall carpet versus rugs.
- Plain and figured neckties.
- Light and dark furniture finish.
- Bare heads versus hats for men.

Marketing a new product can be a tricky business. (See the November Digest, page 11, for a discussion of how a sound marketing program can mean the difference between profit or loss in a new product.) One field has just barely been explored. It's the risk-taking patterns that show up when a group of consumers are faced with a new product.

Studies at Massachusetts Institute of Technology shed some light on this problem. The studies aimed at finding the criteria for consumer acceptance. Basic point made was that people have a high degree of willingness to try something new. In deciding whether to buy a new product, the consumer weighs the amount of risk he is willing to take against the amount of ensuing reward if the product proves successful. One test showed that 93% of the choices were gambling choices, and that within the risk limits of nine-to-one odds there was no point in risk-taking beyond which some of the subjects tested would not go.

More companies could well go outside their own fields to get ideas. Devoe & Raynolds, Inc., a paint manufacturer, deliberately focussed the attention of its sales executives on marketing and sales studies in virtually noncompetitive fields. Purpose—a fresh viewpoint.

The company's top sales executives spent 1 week at the University of Louisville, studying case histories of pharmaceutical, electrical, carpeting, linoleum, brewing, asphalt and rubber tile, farm and automotive equipment companies. The "management course" concentrated on selection and training of salesmen, utilization of effective sales management techniques, and reduction in distribution costs.—Chem Wk, Sept 18, p72

If your quality-control program isn't doing its job, here's an idea from Wa. Swasey Co. The inspector writes up an excess reject card on any job having trouble holding engineering specifications. That requires operator, foreman, and inspector to study the job the next time it comes up. A second reject card brings in representatives of other departments. Again, they study method, tooling, and design. Results: solution invariably found, scrap reduced, quality improved, employees' morale raised.—Am Mach, Oct 11, p142

Giving executives a company-paid medical checkup annually is helping hundreds of U. S. firms improve management health and longevity.

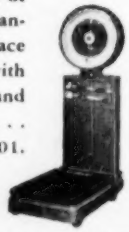
One nation-wide non-profit examining agency alone now has 300 companies, including such giants as U. S. Steel, General Motors, and U. S. Rubber, among its clients. Costs average $35 individually. To ensure privacy, findings go only to the examinee, and occasionally his doctor.

Typical results are reported by U. S. Rubber. Here is how percentage of major abnormalities among its executives fell in 6-year period:

- Overweight cases—from 19.3% to 7.7%
- High blood pressure—from 16.5% to 9.2%.
- Abnormal electrocardiograms—from 18.5% to 8.4%—Business Wk, Sept 11, p101

44 Ways Better...

A great new line of Toledos! *44 new features* are now added to the traditional accuracy and dependability of Toledo Scales including—double pendulum mechanism in one-piece sector design . . . dial installed to face any of eight directions . . . new clean-line design with handsome gray finish. Complete range of types and capacities. Get your scale information up-to-date . . . write today for the new condensed catalog No. 2001. Toledo Scale Company, Toledo 1, Ohio, U.S.A.



Model 2181—New version of the world's most widely used portable dial scale.

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HEADQUARTERS FOR SCALES

Electronic Ore Weigher Speeds Railyard Work

Electronic computation has been extended to iron ore weighing at Great Northern Railway's Allouez yard in Superior, Wisconsin. A new "Ore-Car Data Processing Machine"—developed by Engineering Research Associates, a division of Remington Rand—automatically calculates and aggregates net ore weight of every car in a complete train.

Gross weight of each car is registered on a scale indicator inside the scale house, then transmitted to a computer and converted into digit form. At the same time, the car number is flashed to the machine by a keyboard operator.

The machine reaches into its "memory," where tare weights of all GN cars are stored, calculates net ore weight, retains this information while other cars are being processed, then strikes a net weight for the entire waybill.

Information quickly processed and teletyped to mines and docks produces these advantages: (1) mines can determine whether more ore is needed to complete loading of a ship; (2) guesswork is eliminated from the delicate job of providing different grades of ore in correct amounts to meet steel mill requirements.—Railway Age, Oct 11, p27

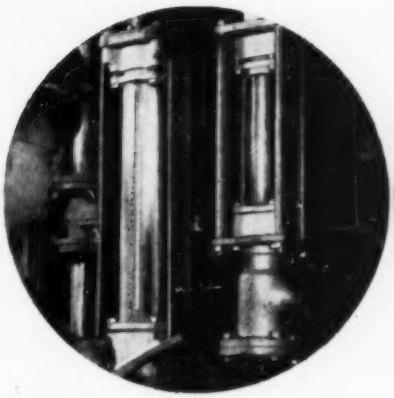
Jumbo Mounts 14 Drills

A drill jumbo that mounts 14 Gardner-Denver drills in a row and slides on aluminum rails is speeding the excavation of the 8,000-ft.-long tailrace at Roanoke Rapids Dam, N. C. Central Eng'rg. and Contracting Corp. developed the rig to drill blast holes the full width of the channel at one time.

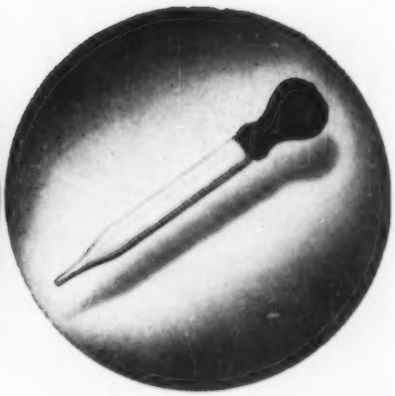
Holes are drilled about 7 ft. apart. Spacings can easily be adjusted, however, by sliding the drills on a horizontal pipe support. Each drill has a cantilevered steel-grating platform from which the driller works his controls.

After a line of holes is drilled, three air tuggers pull the rig ahead on seven lines of blocked-up aluminum rails. The lightweight rails are easily moved by hand.—Const Meth & Equip, Oct, p148

Glass tubing serves as a protective cartridge for fluorescent tunnel lighting.

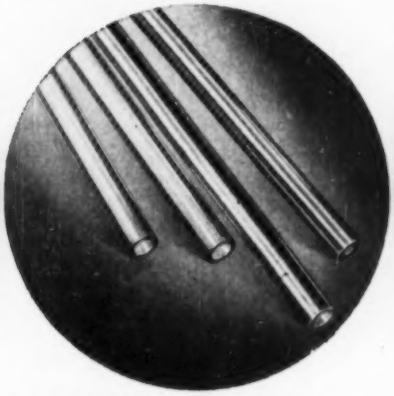


Rate of flow of liquids checked with Rotometers.



Baster tubes help the housewife handle hot liquids.

CORNING brand pipe used as a structural material for new Johnson Wax Building.



Steam under high pressures requires tough corrosion resistance of CORNING brand gauge glasses.

Colored tubing for Neon signs possesses high dielectric strength.

Have You Ever Considered Glass Tubing?

As you can see, some imaginative engineers have used glass tubing by Corning to solve quite a range of problems. Supplied by Corning in a wide variety of characteristics and dimensions, it lends itself to countless applications. Available now and not too costly, it is worth a good look.

Here are some of the "built-in" properties you can have with Corning tubing. First, you can see through it for checking flow, volume or quality. Sudden temperature changes won't bother it. Acids and mild alkalies have little effect. It resists corrosion.

For electrical applications, Corning can give you glass tubing that is high in dielectric strength and that seals to metal. Tubing can also be had in various colors. Where precision is required, Corning can supply tubing to extremely close tolerances.

Consider glass tubing in your next design problem. Chances are Corning can furnish you with exactly what you want. You can buy it in small pieces or 10 ft. lengths in diameters from 1 mm. up to 6". Our engineers have the story—they're ready to help you. Drop us a line . . . let us know what you have in mind.

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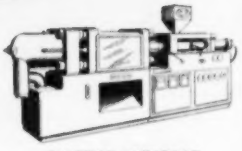
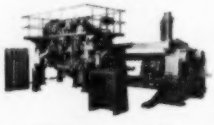
NOW! Readily Available for the European Market!

Aerial view of the "Breda" plant which manufactures WATSON-STILLMAN Hydraulic Equipment for the European market.



PLASTICS MOLDING MACHINERY



EXTRUSION PRESSES

METALWORKING PRESSES

RAILROAD SHOP EQUIPMENT

The establishing of a new European subsidiary now makes WATSON-STILLMAN Hydraulic Equipment easily available to that market from one nearby source.

Sales and service are conducted in Rotterdam, Holland, by the new subsidiary, Watson-Stillman Internationale, Maatschappij, N.V. Manufacturing facilities have been established with N.V. Machinefabrick "Breda", formerly Backer en Rueb, of Breda, Netherlands.

"Breda" manufactures a complete line of WATSON-STILLMAN Hydraulic Machinery for the plastics, metalworking, railroad and general industries. The new subsidiary offers the European market a wider range of hydraulic equipment produced there, with the added advantages of shorter delivery time and more convenient sales and service facilities.

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Synthetic-Fiber Outlook Favors New Applications

The development picture in the U. S. synthetic-fiber and yarn field looks like this:

- One new fiber, Teflon, announced by E. I. du Pont de Nemours & Co., Inc., is a tetrafluoroethylene fiber with unusual resistance to heat and chemicals.
- Most producers are trying to eliminate defects in fibers and broaden uses by diversifying properties.
- Predyed fiber (also called dope-dyed, spun-dyed, and solution dyed) is available in more types of fibers and wider ranges of colors.
- Acrylic-fiber producers are working toward a satisfactory continuous-filament fiber.

Textile mills provide this picture:

- Rayon now has a large portion of the looped tufted-carpet business. Several firms are experimenting with carpet rayon for other uses.
- Nearly all acrylic fibers, both staple and filament, are good in brushed, napped, or pile fabrics.
- Low percentages of nylon staple are going into blends with wool to improve abrasion resistance.—Textile World, Sept, p59

Ultrasonics Plus X-ray

Increasing use of nondestructive testing throughout U. S. industry, particularly by ultrasonics and industrial X-ray, is bringing substantial sales to electronic manufacturers.

Ultrasonics—SIMAC (sonic inspection, measurement, and control), a device developed by Sperry Products at a cost of $300,000, is one of the newest applications. It automatically and completely scans a circular part mounted on a rotating turntable immersed in water by beaming ultrasonic waves into it. Beams reflected by structural discontinuities, which may be defects, are logged on a circular chart.

X-ray—Some casting firms spend $25,000 monthly on X-ray inspections. X-ray inspection of castings up to 5 ft. in dia. costs about $7.50 per casting while destructive testing averages $350 a piece.—Electronics, Sept, p14

Models Helped Planning of Plant and Processes

Two kinds of three-dimensional scale models helped Clark Equipment Co.:

- **Gain** useful occupancy of its new 145,000-sq. ft. plant 3 months ahead of schedule.
- **Save** thousands of dollars in engineering costs.
- **Provide** efficient manufacturing from the start of operations.

First step in planning the new plant was to lay out, on paper, a floor plan showing the shape and size of the building. From this a ¼-in.-to-1-ft. model was prepared. The model helped visualize material flow, materials-handling equipment, special equipment, clearances. Engineering drawings were made from this model.

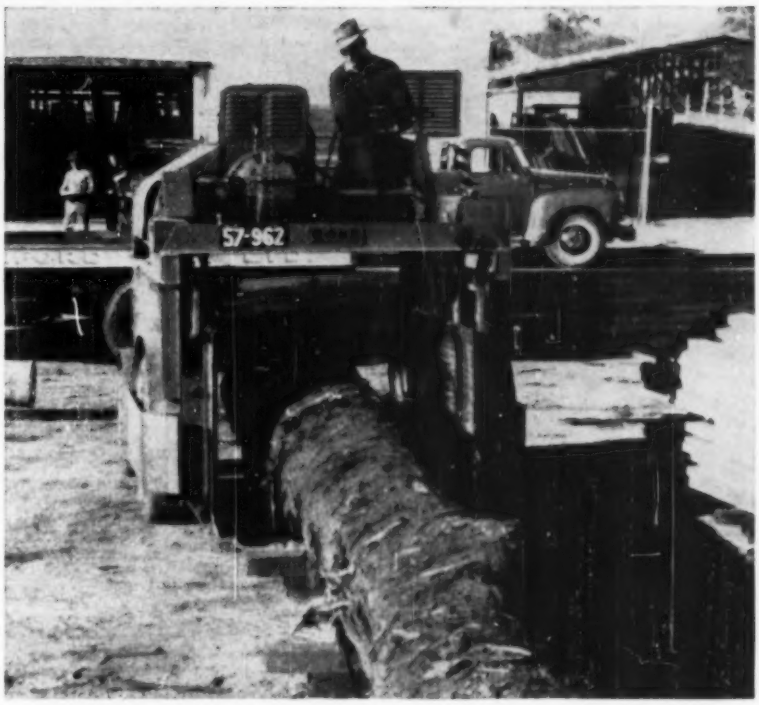
A second model, ½ in. to 1 ft., was then made. It influenced design of storage racks and methods of handling components from one location to another. Specific operations were pinpointed where certain types of handling equipment were desirable. Storage racks and areas were designed to permit "visual" inventory control.—Factory, Oct, p110

New Jobs for Cationics

Their ability to eliminate static electricity is expected to point to new uses for cationic compounds. An example is the interest that floor-wax makers, plastics molders, and a lot of other manufacturers are taking in American Cyanamid Co.'s new additive, Cationic SP. It frees waxes of static after buffing, yields plastic articles that attract little dust.

The two big jobs of cationics is as germicides and textile softening agents. As germicides, the quaternary ammonium compounds have acquired a sold reputation among specialties manufacturers for industrial sanitization. Consumer market acceptance has been poor. They do find use in cosmetics.

In textile mills, cationics serve as softening agents, antistatic agents, antisoil agents, dyeing assistants. Growing use of synthetic fibers is boosting cationic use for antistatic purposes. — Chem Wk, Oct 9, p74



ONE MAN handles 100,000 board feet of lumber IN ONE WORKING DAY!

From Australia comes this typical example of the unique advantage of the Ross Carrier, a product of Clark Equipment. Douglas Jones Pty. Ltd. (Guildford, Western Australia) employs Carriers to handle logs and cut lumber. The Carrier (capacity 10,000 lbs.) simply drives over its load, engages its load hooks (in 5 seconds) and drives away at highway speeds. It is a simple one man operation to handle 35 ft. logs; and records show that one man can transport 100,000 board feet of lumber in one working day.

The Ross Carrier, in capacities from 10,000 to 50,000 lbs., has proved its adaptability for all types of handling jobs. It is unquestionably the most efficient horizontal handling method ever devised: one man loads it, drives it, unloads it. Let your experienced Clark-Ross distributor explain how the Carrier can benefit your own business; write us for his name.

An informative booklet, which gives numerous case histories of Carrier-handling in a broad variety of industries, is yours on request—write for it.

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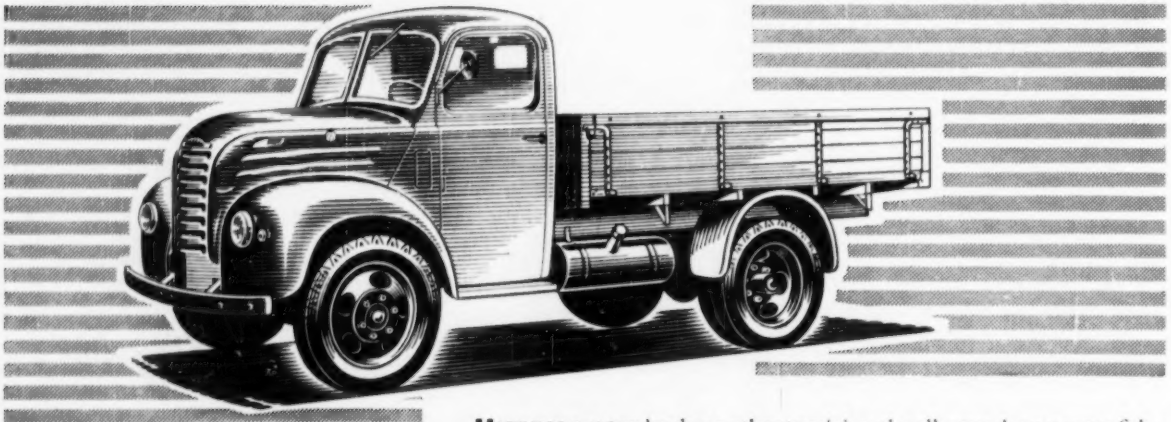

HAULING 2-3 ton loads no other truck has the all-round economy of the Thames 4-Cylinder 'Cost-Cutter'. Its outstanding saving guarantees a bigger profit even on your contract-clinching low bids. For this truck has *exactly the right power for the job.* It has too the precision-built design to keep it *on* the job longer with less maintenance.

- *Strong, wide and flat chassis for extra stability and easy body-building.*
- *Girling Hydraulic, two leading shoe brakes.*
- *Outstandingly strong gear box and clutch.*
- *Semi-forward control; 12-volt electrical system.*
- *Test it for yourself—your local Ford Dealer will gladly arrange a trial.*

Ask your dealer for details of the full range of famous Thames V.8 Commercial Vehicles. You have a choice of engines—the powerful, economical 85 b.h.p. V.8 engine, or the famous P.6 Diesel.

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Outlook for Lignin—New Chemical Source

So much lignin is produced by pulpmakers as a byproduct that they dump it, burn it, and still have trouble getting rid of all of it. One answer researchers are looking for is greater use as a raw material for chemicals. Here are a few of lignin's industrial uses so far developed:

• **Rubber Reinforcement**—Lignin, dissolved in rubber latex and coprecipitated with rubber by acid, serves as a reinforcing agent similar to carbon black and mineral pigments. Advantages: lighter-weight rubber with high tensile and tear strengths, elongation, and hardness.

• **Asphalt Stabilization**—Lignin's top commercial outlet is as a stabilizer for oil in water-type, slow-break asphalt emulsions.

• **Ceramic Binders**—Lignin strengthens dried, unfired bodies, prevents breakage, burns out during firing. It also maintains fluidity for shaping ceramic pieces with minimum of water.

• **Leveler, Dispersant**—The textile industry uses lignin as a leveling agent to retard dye absorption rate for cotton and regenerated cellulosic textiles with vat and sulfur dyes. Another use is as a dispersant for acetate dyes.

• **Plastic Extended**—Lignin can extend or replace phenols in making phenol formaldehyde resins. Up to 50% lignin does not affect quality.

• **Degradation Products**—These are in the future. Already known is that oxidation yields benzene derivates; hydrogenation, cyclohexane derivatives; other reactions, a wide variety of phenols, acids, alcohols, and hydrocarbons.—Chem Eng, Sept, p144

Helical Carbide Cutters

Replacing straight-bladed carbide cutters with helical-bladed carbide cutters has improved milling performance at Short Bros. & Harland Ltd., Belfast. Tips are applied in 2-in.-long sections.

The new cutters give better surface finish and stand up longer on high-tensile steels than do the straight-bladed cutters or helical high-speed steel mills. One job, machining a steel heat-treated to a tensile strength of 156,000 lb. per sq. in., used high-speed end mills at the rate of one per component. Applying a three-bladed, 20° left-handed-helix, zero-radial-rake carbide cutter permitted milling 20 pieces with only one regrind.—Mach, Aug 28, p1525

Aerial Line Stringer

Stringing of additional overhead power conductors where one line already exists is speeded through use of a propeller-driven device at the Hawaiian Electric Co.

Heart of the device is a 7.5-hp. gasoline engine mounted, along with fuel tank and ignition system, on a rectangular welded pipe frame. Latter rides on four guide wheels on the de-energized overhead conductor. Line is paid out from a 4,000-ft., 120-lb. reel attached to hooks on the frame.

In use, the wire stringer has zipped across 4,000-ft. stretches of conductor in 2.5 min.—Elec World, Sept 20, p142

Titanium Briefs

▶ **Titanium rivets** are being driven successfully with the aid of resistance heating at Glenn L. Martin Co. System combines standard resistance heating equipment with standard portable and stationary riveting machines.—Sept 20, p44

▶ **Bell Aircraft Corp.** has developed a method for removing scale from hot-formed titanium parts on a production basis. Process includes a 5- to 10-min. bath in sodium hydroxide at 720° F., followed by cold-water spray and nitric-hydrofluoric acid dip.—Sept 13, p46

▶ **A titanium-ingot plant** (Britain's first), with a 1,500-ton annual capacity, is nearing completion for Imperial Chemical Industries.—Sept 13, p38

▶ **A $31.5-million** titanium production plant, largest in the U. S., will be built by Union Carbide and Carbon Corp. under an agreement with U. S. government. It will boost output to 22,500 tons yearly.—Aviation Wk, Sept 27, p18

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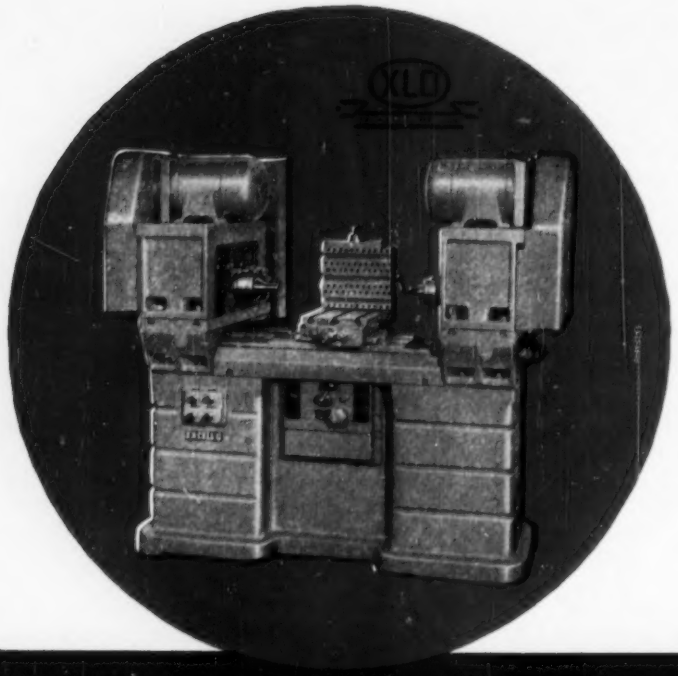

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Airline Credit

. . . spurs boom in travel as U. S. and overseas lines adopt "Fly Now, Pay Later" programs

NATIONAL AND INTERNATIONAL air travel is expected to get a powerful impetus from the rapid spread of "Fly Now, Pay Later" plans. The U. S. scheduled airline industry is headed for early mass adoption of credit plans. Foreign airlines are now joining the parade.

The program was begun in mid-May by Pan American World Airways, with the first big "pay later" advertising campaign. Although credit ticket sales in the first 3 months were only $1.5-million (3% of total business), results were considered so promising that PAA devoted its entire $1-million advertising program for the last quarter of 1954 to the campaign.

A steady increase in credit business is PAA's immediate expectation, then a big upswing in "pay later" sales next summer when the results of promotion are reflected in vacation sales. Another leader, Trans World Airlines, reported $250,000 in sales during the first 20 days of its program.

Prices on "pay later" tickets have ranged from $33 to $4,000, the latter for a businessman who preferred not to make one big dip in his firm's cash box. TWA is pushing low-cost as well as high-cost tickets. For example, Chicago-New York round trip for $7.50 down and $3.06 a month.

The American firms are capitalizing on a credit idea never adopted by railways or shipping. They hope customers now will buy vacations concurrently with television sets and automobiles, instead of buying TV's and cars "on time" and putting off the vacation until the total price has been saved.

Among overseas firms to join the trend, Scandinavian Airlines was first in the field with an all-out "pay later" program. British Overseas Airways Corp. and Sabena Belgian Airlines will offer similar plans in the near future.—Aviation Wk, Sept 13, p12

From Peat to Chemicals

British Fuel Research Station is investigating peat, in the form of peat wax, as a new raw material for chemicals. The wax consists of a series of high-molecular-weight organic compounds containing three or more functional groups.

Peat wax can be classified as resins, true wax, and asphalt on the basis of differing solubilities in organic solvents. Molecular weights run 690 for resins, 1330 for true wax, and 2090 for asphalt.

At this stage, peat is a long way from commercial development as a chemical source. But already it is evident that plastics could probably be made from the wax.—Pet Proc, Sept, p1304

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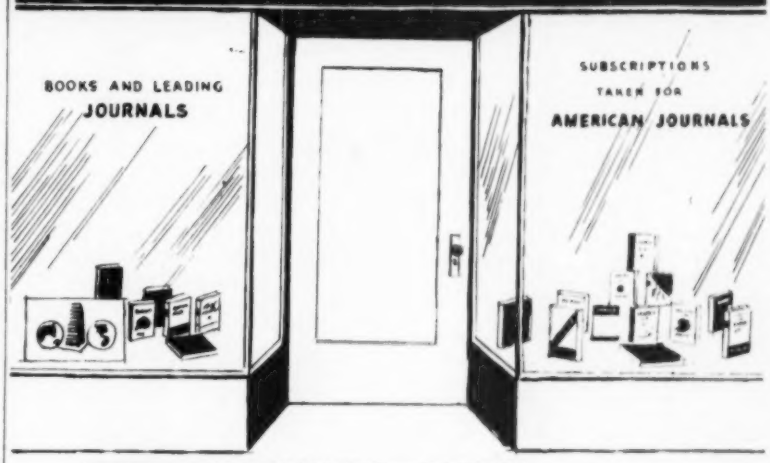

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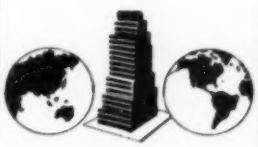

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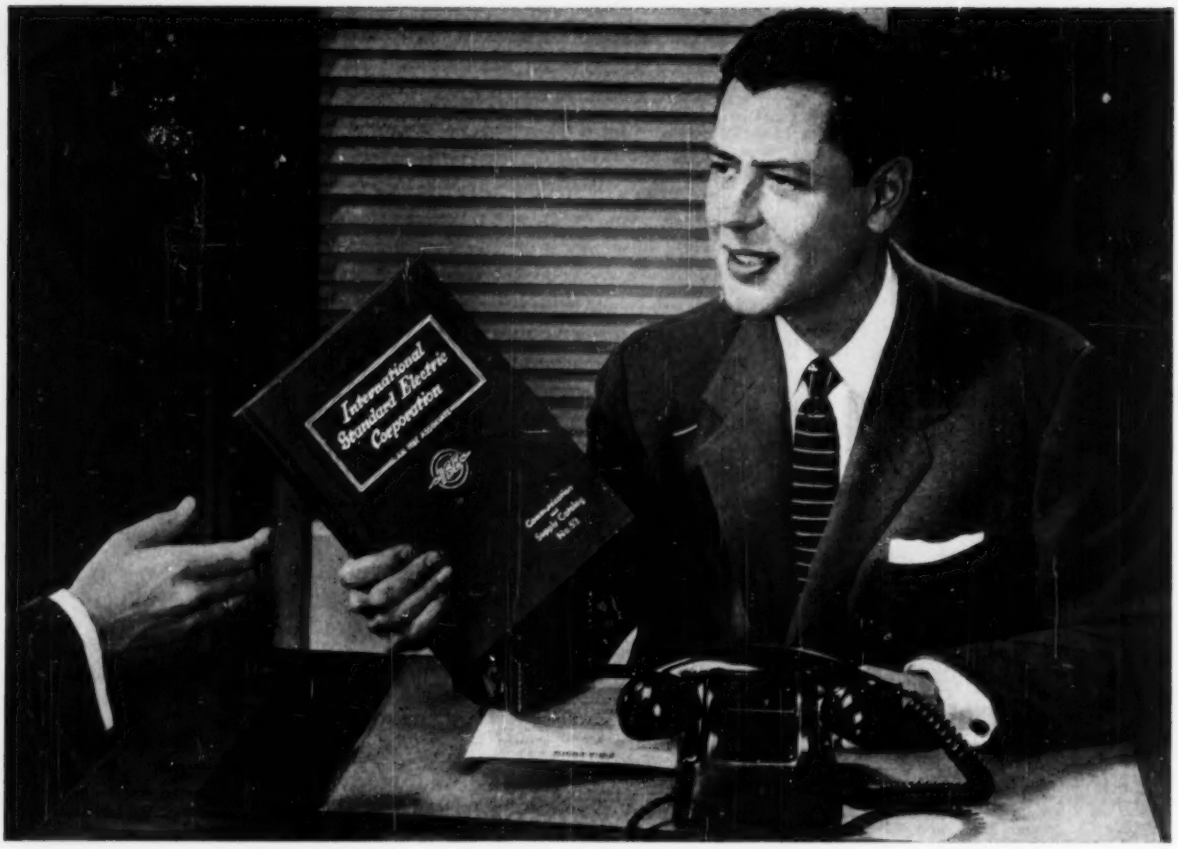

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Industrial Gloves—Catalog contains information on Stanzoil gloves, made of neoprene. They are resistant to the damaging effects of oils, greases, solvents, acids, caustics.—Pioneer Rubber Co., Willard, Ohio.

Chlorinators—Technical information is available on air-operated master chlorinators for every municipal and industrial need.—Wallace & Tiernan Co., Inc., Newark 1, New Jersey.

Office Copying Machine—Literature is available on new Bambino copying machine.—General Aniline & Film Corp., Antara Div., Johnson City, N. Y.

Industrial Tires—Bulletin TD-200 gives complete test data on Mono-Cushion industrial tires.—Monarch Rubber Co., 240 Lincoln Park, Hartville, Ohio.

Investment Service—"Market Pointers," a highlight report prepared by the company's research department, contains major articles, graphic charts, and security facts, figures, and forecasts.—Francis I. Du Pont & Co., 1 Wall St., New York 5, N. Y.

Tube Mills—The Yoder Tube Mill Book tells the story of electric-weld tube making and answers many questions of interest to prospective tube-mill owners.—The Yoder Co., 5517 Walworth Ave., Cleveland 2, Ohio.

Industrial Equipment—Detailed information is available on rolling mills, steel grating, transit mixers, and road pavers for construction and general industry.—Blaw-Knox Co., Export Dept., 405 Lexington Ave., New York 17, N. Y.

Hoists and Jib Cranes—Bulletin contains complete information on hoists and jib cranes and tells how they will make your big lifts easier.—R. G. LeTourneau, Inc., 2411 South MacArthur, Longview, Texas.

Hand-operated Chuck—Catalog D228 contains special features and advantages of the Forkardt Type F hand-operated chuck.—Paul Forkardt, Kommanditgesellschaft, Dusseldorf, Germany.

Locomotive Cranes—Catalog describes the 30-, 40-, and 50-ton capacity diesel-electric locomotive cranes that perform a wide range of materials-handling operations with speed and precision.—Industrial Brownhoist Corp., Bay City, Mich.

Milling Machines—Catalogs 4110 e/8/53 and 4109 e/8/53 contain complete information on Models BF and FB horizontal milling and boring machines.—Schiess Aktiengesellschaft, Hansaallee 289, Dusseldorf-Oberkassel, Germany.

Water-soluble Cellulosic—Form 500-192 gives the latest information on CMC-CT, a water-soluble cellulosic. Applications include wallpaper adhesives, synthetic detergents, and built soaps.—Hercules Powder Co., Wilmington, Del.

Hydraulic Brake Parts—Booklet H-53 contains information on hydraulic brake parts for passenger cars, trucks, and buses.—Thermoid Co., Trenton, N. J.

Alloy Steels—Book, "Alloy Steels Pay Off," shows some of the changes in economic factors that have made alloy steels as a class increasingly more priceworthy. For your copy, write on your company letterhead.—Climax Molybdenum Co., 500 Fifth Ave., New York 36, N. Y.

Remote Bulb Thermometers—Catalog 6709 on remote bulb thermometers covers selection data, recorders and indicators, pneumatic, electric and program control, psychrometers, bulbs, tubing, and fittings.—Minneapolis-Honeywell Regulator Co., 2747 Fourth Ave. S., Minneapolis 8, Minn.

Gear Hoist—Bulletin CH describes a lightweight spur gear hoist of formed steel construction that features easy portability and resistance to shock load breakage.—Coffing Hoist Co., Danville, Ill.

Glass Blocks—Catalog GB-101 contains information on physical performance, technical data on light transmission, insulation values, installation details, accessory materials, and complete specifications.—Pittsburgh Corning Corp., 1 Gateway Center, Pittsburgh 22, Pa.

Milling Machine—Catalog contains complete information on Number 24-L plain and universal type milling machine.—Van Norman Co., Springfield 7, Mass.

Temperature Indicators—Bulletin A-303-1 describes two portable temperature indicators, used by industry for periodic temperature tests to spot impending troubles in equipment.—Foxboro, Mass.

Mill Bearings—New series LPK6800F heavy-duty roller bearings, especially designed for severe operating conditions found in steel mills, mines, and foundries, are described in book 2565.—Link Belt Co., 233 Broadway, New York 7, N. Y.

Oil-field Equipment—Bulletin WP-1099-B42F contains detailed information on complete line of oil-field and pipe-line equipment.—Worthington Corp., Harrison, N. J.

Electric-generating Plants—How electric-generating plants are used in many different applications is told in Vol. 10 No. 2 of "Power Points Digest."—D. W. Onan & Sons, Inc., Minneapolis 5, Minn.

V-belts—Catalog 2170 describes construction features of Grommet V-belts.—B. F. Goodrich Co., Akron, Ohio.

Compressors—Operation and construction features of Allis-Chalmers single-stage, water-cooled rotary compressors and vacuum pumps are described in bulletin 16B8126.—Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Packaged Speed Variators—Bulletin GEA-6127 explains the operation and application of the basic speed variator and the many additional features that are available with the new equipment. — International General Electric Co., 570 Lexington Ave., New York 22, N. Y.

Unit Heaters—A new series of low-outlet-temperature horizontal unit heaters, designed for use on high-pressure steam systems not to exceed 125 lb. per sq. in. gage, are described in bulletin 700.—Herman Nelson Products, American Air Filter Co., Inc., Louisville, Ky.

Machine Tools—Precision machines, cutting tools, and precision parts are illustrated in bulletin B54-1.—Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Measuring Equipment—Equipment for measurement and control of liquids and gases, applicable for water and sewage works and power and processing industries, is described in Bulletin 004.—Simplex Valve & Meter Co., 68th and Upland Streets, Philadelphia 42, Pa.

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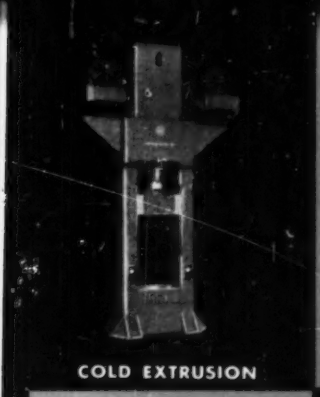
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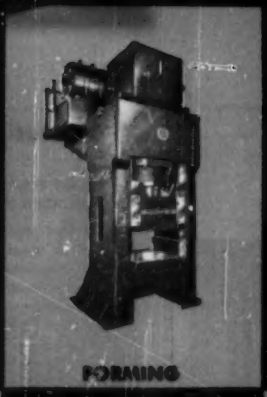
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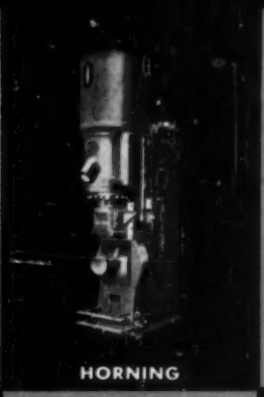
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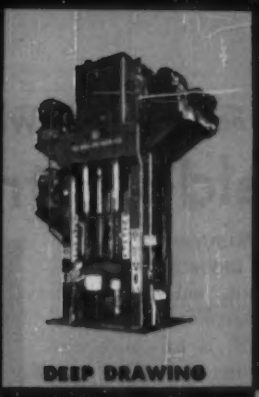
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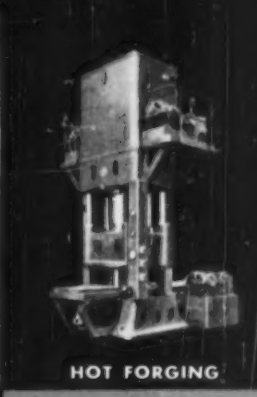
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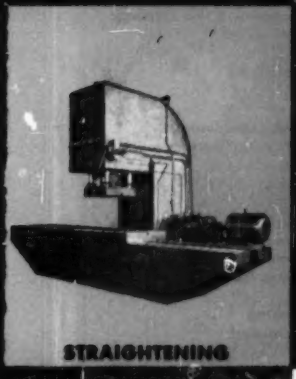
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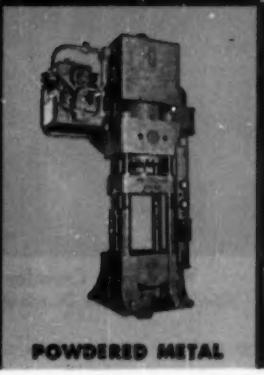
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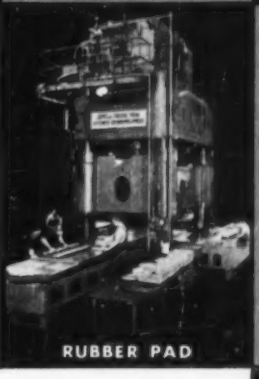
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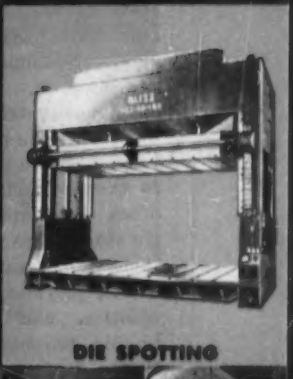
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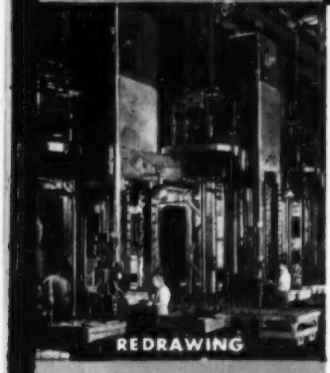
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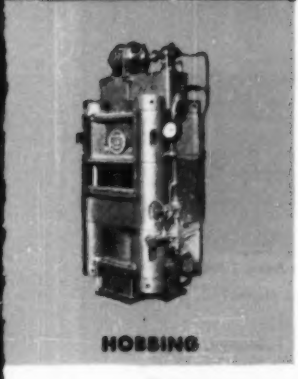
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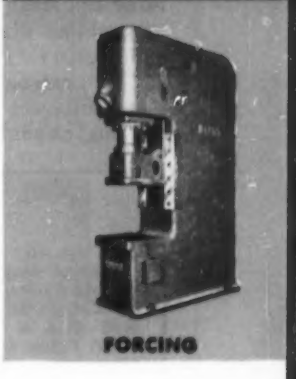
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Its Field: Distribution

INDUSTRIAL DISTRIBUTION is edited exclusively for industrial distributor management, salesmen, and key operating personnel. Since its founding in 1911, it has been devoted to serving the $4-billion industry that supplies American industry with essential production and maintenance tools, equipment, and supplies.

The industrial distributor can be termed the department store of industry. He buys and takes title to the products of many diverse, often far-distant manufacturers. He stocks these products. He sells them to manufacturing plants, mines, quarries, oil fields, railroads, utilities, and service industries in his trading area. The location of industrial distributors closely parallels industrial activity. In all, there are some 2,500-odd main and branch office industrial distributor organizations in the United States.

The editors of *Industrial Distribution* know their field. They travel thousands of miles yearly, calling on distributors across the country. They talk with all levels of distributor personnel, from presidents and sales managers to countermen and order clerks. They visit large and small distributor houses, general-line distributors and specialists.

This extensive contact with many different distributors under varying circumstances puts them

Walter F. Crowder
Editor, Industrial Distribution

in a unique position to appraise and report the significant developments and happenings in the field. *Industrial Distribution's* editors give distributors specific information on how to do a better, more profitable job in the performance of their various operating functions.

In 1953, *Industrial Distribution's* seven traveling editors covered 79,990 miles to talk shop with industrial distributors and their salesmen in 207 cities before writing 1,453 pages of editorial material. The editorial material is always timely, always stimulating. It is business news of first importance to distributor personnel. And it serves the men who supply industrial America.

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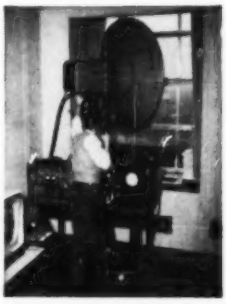

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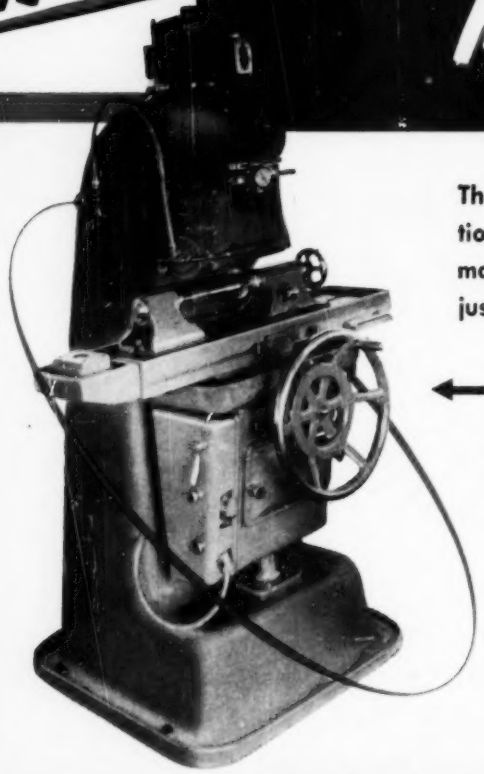
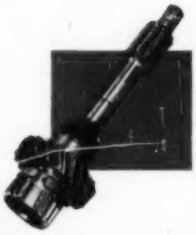
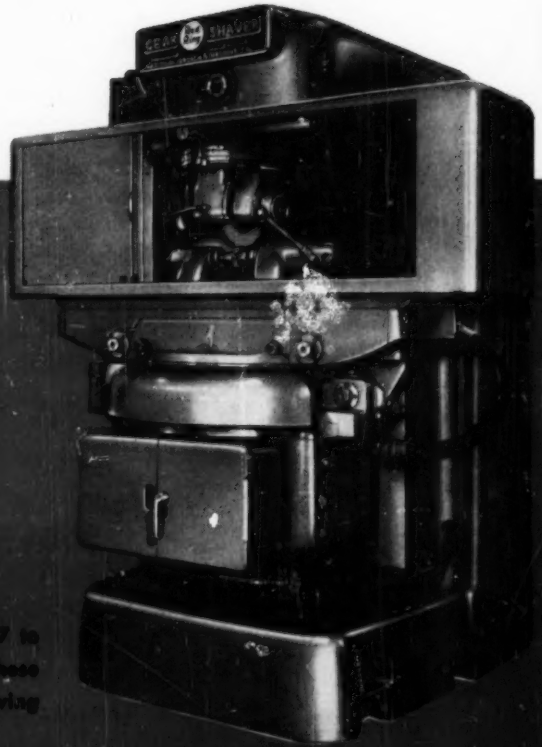


The one sure way of meeting today's competition is with today's machine tools. The older machines were all right in their day but they just haven't got what it takes now.

← **For instance,** it took this old Red Ring Model GCC 60 seconds to shave a gear like the one shown. →

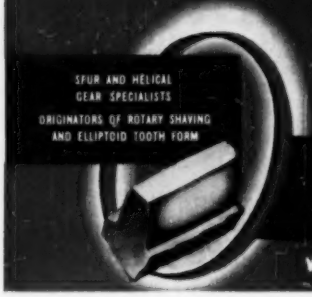




Model GCU today finishes that same gear in just 16 seconds—and to much closer tolerances, too.

In an 8 hour day the GCU will deliver 375% of the production of its predecessor.

Write for Bulletin S 58-7 to get all the facts on these new cut saving gear shaving machines.



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